



west virginia department of environmental protection

Groundwater Programs and Activities Biennial Report to the West Virginia 2018 Legislature

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GROUNDWATER BIENNIAL REPORT TO THE 2018 LEGISLATURE

I. EXECUTIVE SUMMARY

The Groundwater Protection Act, West Virginia Code Chapter 22, Article 12, Section 6.a.3, requires the West Virginia Department of Environmental Protection (WVDEP) to submit a biennial report to the legislature on the status of the state's groundwater and groundwater management program, including detailed reports from each agency that holds groundwater regulatory responsibility. This is the twelfth Groundwater Biennial Report to the legislature since the passage of the Act in 1991, and covers the period from July 1, 2015 through June 30, 2017.

The WVDEP Division of Water and Waste Management (DWWM) Groundwater Program is responsible for compiling and editing the information contained in this report. The WVDEP, the West Virginia Department of Agriculture (WVDA), and the West Virginia Department of Health and Human Resources (WVDHHR) all have groundwater regulatory responsibility and have contributed to this report. The boards and standing committees that share the responsibility for developing and implementing rules, policies, and procedures for the Ground Water Protection Act are: the Environmental Quality Board, the Groundwater Coordinating Committee, the Groundwater Protection Act Committee, the Groundwater Monitoring Well Drillers Advisory Board, the Well Head Protection Committee, and the Non-Point Source Coordinating Committee.

The purpose of this report is to provide a concise, yet thorough, overview of the programs charged with the responsibility of protecting and ensuring the continued viability of groundwater resources in West Virginia and to express the challenges faced, and the goals accomplished as the agencies, programs, and committees work together to protect and restore West Virginia's water resources.

Research regarding specific hydrogeologic information about the state's groundwater, such as regional and local potentiometric surfaces (water levels), groundwater quality, groundwater flow studies, and access to statewide dedicated groundwater monitoring data continues. As more regulated development occurs, especially pertaining to stormwater discharge, the WVDEP continues to compile a database of constituents found in stormwater that can be utilized to protect groundwater resources. As more stormwater discharge sites come under regulation, a clearer picture begins to emerge of potential contaminants found in stormwater.

The Ambient Groundwater Quality Monitoring Network was established by DWWM in cooperation with the United States Geological Survey (USGS) in 1992, and is an ongoing project. This network provides valuable data critical to the management of West Virginia's groundwater resources. The major objective of the study is the assessment of the ambient groundwater quality of major systems (geologic units) within the state, and the characterization of the individual systems. Characterization of the quality of water from

the major systems will help to (1) determine which water quality constituents are problematic, (2) determine which systems have potential water quality problems, (3) assess the severity of water quality problems in respective systems, and (4) prioritize these concerns. Only by documenting the present ambient groundwater quality of the major systems can regulatory agencies assess where water quality degradation has occurred and where potential degradation is a result of natural processes or human activity.

The USGS West Virginia Water Science Center, in cooperation with the West Virginia Department of Environmental Protection's Division of Water and Waste Management, collects and analyzes water samples and interprets the analytical results of these samples as part of the Ambient Groundwater Program. The program alternates between long-term monitoring of a set of 25 "sentinel" wells and focused topical studies that examine factors that may influence groundwater quality.

The sentinel wells, selected to represent important environmental settings in West Virginia, are sampled every five years to evaluate trends in groundwater quality. Samples from these wells are analyzed for major ions, metals, trace elements, and nutrients. Analyses for organic compounds were performed on samples from sites susceptible to such contamination, based on previous studies (Chambers and others, 2012; <http://pubs.usgs.gov/sir/2012/5186/>). The first round of sentinel well samples was collected in 2010 with a second round scheduled for 2015. The Ambient Groundwater Program ended on September 30, 2015 with no further activities planned.

Topical studies are conducted in the four years between rounds of sentinel well sampling. In topical studies water-quality samples are collected, analyzed, and the results presented in a USGS Scientific Investigation Report. Since 2011 the USGS has collected samples to determine baseline water-quality conditions in Upper Monongahela River Basin, an area of Marcellus Shale gas development. Groundwater samples from 41 wells and baseflow samples from 50 surface-water sites were collected and analyzed for major ions, metals, trace elements, and naturally-occurring radioactive materials. The results of these analyses were published in a USGS report *Water quality of groundwater and stream base flow in the Marcellus Shale Gas Field of the Monongahela River Basin, West Virginia, 2011–12* (Chambers and others, 2014, available at <http://dx.doi.org/10.3133/sir20145233>) completed in September 2014.

While many challenges remain, much has been done to provide protection and continued viability of West Virginia's groundwater resources. The WVDEP, WVDA, WVDHHR, and USGS continue to work closely to fulfill the mission of the Department of Environmental Protection, "Promoting a healthy environment".

II. GROUNDWATER PROTECTION and WATERSHED MANAGEMENT

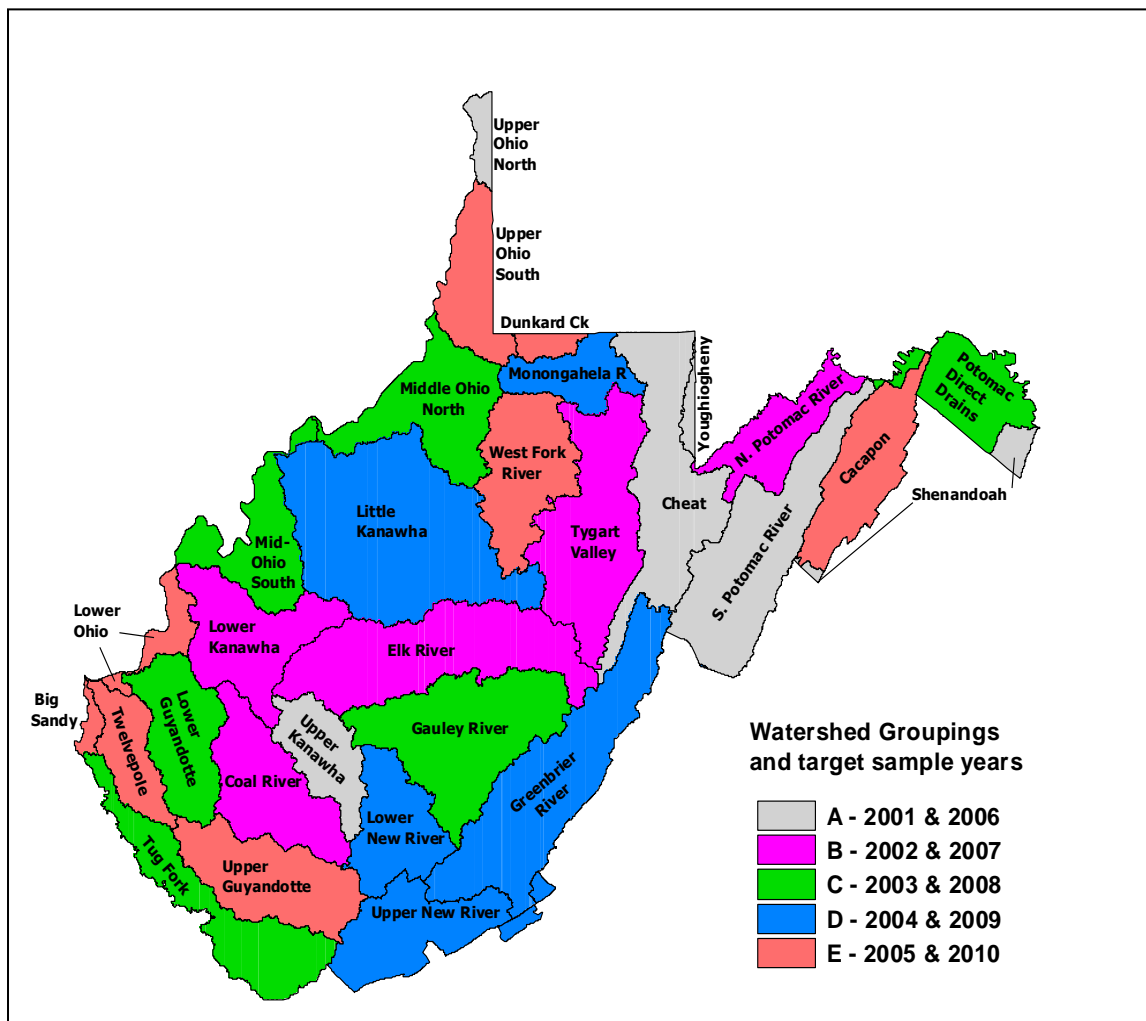
Under the guidance of the United States Environmental Protection Agency (EPA) and the signing of the West Virginia Watershed Management Framework Document (signed in 1997), a new approach to management of the state's groundwater has begun. Total watershed management strives to bring a holistic approach to protecting the waters of the state. The signing of this document by the agencies that chose to participate as

partners indicates their understanding that, by collective agreement and cooperation, stakeholders can better achieve the goals of individual water quality programs. WVDEP has chosen to participate as a partner and stakeholder in watershed management in West Virginia.

Agencies having groundwater regulatory authority and responsibility provide repositories for ground and surface water data collected about those facilities under their authority. As stated in this report's executive summary, compilation of the available groundwater data into a collective database continues as a work in progress, providing a picture of the state's groundwater protection activities and the contributions of the associated programs.

Eventually, all groundwater data that is generated by these activities and facilities will be housed in a central data repository overseen by senior scientists from each agency under the guidance of the WVDEP's Groundwater Coordinating Committee and Information Technology Office. We anticipate that population of the central database will be implemented using a watershed approach. Each watershed is comprised of smaller divisions called sub-watersheds from which data will be gathered and entered systematically until the larger picture emerges.

A map depicting the 32 watersheds and hydrologic groupings is shown below in Figure 1.



West Virginia Watershed Groups

III. BOARDS and COMMITTEES

The following boards and committees are responsible for developing and implementing policies, procedures and rules to ensure proper application of the Groundwater Protection Act (GWPA).

West Virginia Environmental Quality Board

Appellate Activities

The Board is authorized by *W. Va. Code* § 22-11-21 to hear appeals of agency decisions concerning groundwater protection. The following are administrative appeals which were filed with or addressed by the Board during the last biennial reporting period and include issues arising under provisions of the Groundwater Protection Act:

The City of Buckhannon

Appeal No. 15-02-EQB

Filed: January 14, 2015

Agreed Order: July 8, 2015

RBS, Inc.

Appeal No. 15-04-EQB

Filed: February 4, 2015

Withdrawn: October 5, 2016

Greater Harrison County Public Service District

Appeal No. 15-05-EQB

Filed: February 17, 2015

Withdrawn: December 17, 2015

Danny E. Webb Construction Company, Inc.

Appeal No. 15-09-EQB

Filed: May 8, 2015

Withdrawn: September 10, 2015

Elk Run Coal Company, Inc.

Appeal No. 15-10-EQB

Filed: May 26, 2015

Final Order: December 7, 2015

Four Points Construction, Inc.

Appeal No. 15-13-EQB

Filed: June 29, 2015

Dismissed: February 17, 2017

Berkeley County Public Service Sewer District

Appeal No. 15-14-EQB

Filed: July 10, 2015

Withdrawn: March 23, 2016

Ambassador Baptist Church

Appeal No. 15-15-EQB

Filed: September 14, 2015

Agreed Order: January 11, 2016

Cytec Industries, Inc.

Appeal No. 15-41-EQB

Filed: October 22, 2015

Pending Evidentiary Hearing

Kureha PGA, LLC

Appeal No. 15-42-EQB

Filed: October 29, 2015

Pending Evidentiary Hearing

**West Virginia Highlands Conservancy, Inc.,
Ohio Valley Environmental Coalition, and Sierra Club**

Appeal No. 15-43-EQB

Filed: November 9, 2015

Consent Order: May 25, 2016

Hall Drilling, LLC

Appeal No. 15-44-EQB

Filed: November 20, 2015

Withdrawn: January 29, 2016

M & G Polymers USA, LLC

Appeal No. 16-02-EQB

Filed: August 10, 2016

Pending Evidentiary Hearing

Monongahela Power Company

Appeal No. 16-04-EQB

Filed: October 21, 2016

Pending Evidentiary Hearing

Andrew Zetts

Appeal No. 16-06-EQB

Filed: November 4, 2016

Final Order: May 11, 2017

CONSOL Mining Company, LLC

Appeal No. 16-07-EQB

Filed: November 23, 2016

Settlement Pending

RBS, Inc.

Appeal No. 17-01-EQB
Filed: January 25, 2017
Pending Final Order

Jill Fischer

Appeal No. 17-02-EQB
Filed: February 13, 2017
Pending Final Order

Paul Ashbaugh

Appeal No. 17-03-EQB
Filed: February 22, 2017
Pending Final Order

Rockwell Mining, LLC

Appeal No. 17-04-EQB
Filed: March 10, 2017
Settlement Pending

Aspen Corporation

Appeal No. 17-05-EQB
Filed: April 26, 2017
Withdrawn: May 2, 2017

Jefferson County Emergency Services Agency

Appeal No. 17-07-EQB
Filed: May 26, 2017
Pending Evidentiary Hearing

Tom Rhule

Appeal No. 17-09-EQB
Filed: June 23, 2017
Pending Evidentiary Hearing

WV Rivers Coalition and WV Highlands Conservancy

Appeal No. 17-10-EQB
Filed: June 23, 2017
Pending Evidentiary Hearing

Cow Run, LLC

Appeal No. 17-11-EQB
Filed: June 26, 2017
Pending Evidentiary Hearing

Review of Civil Administrative Penalties

W. Va. Code § 22-12-10 establishes procedures for review of the assessment of civil administrative penalties. This provision provides for an informal hearing to review the penalty, and gives the Board appellate authority for review of the final decision of the agency. There were no appeals filed during the reporting period pursuant to this section.

IV. WEST VIRGINIA DEPARTMENT OF AGRICULTURE

Regulatory and Environmental Affairs Division Water Quality Protection

A. Pesticide Regulatory Programs

A pesticide is defined as any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. Often misunderstood to refer only to insecticides, the term pesticides also applies to herbicides, fungicides, rodenticides and various other substances used to control pests. Pesticides can cause harm to humans, animals, or the environment because they are designed to kill potential disease-causing organisms and control insects, weeds, and other pests. This presents a risk benefit scenario where humans, animals and the environment, including water are at risk to be adversely affected. Therefore, it is deemed necessary to regulate and control pesticides by their registration, use and application.



The Pesticide Regulatory Programs Unit regulates and controls pesticides through [ARTICLE 16A- WEST VIRGINIA PESTICIDE CONTROL ACT](#) and the following legislative and procedural rules:

[TITLE 61 SERIES 12 - FEE STRUCTURE FOR THE PESTICIDE CONTROL ACT OF 1990](#)

[TITLE 61 SERIES 12A -CERTIFIED PESTICIDE APPLICATOR RULES AND REGULATIONS](#)

[TITLE 61 SERIES 12B -LICENSING OF PESTICIDE BUSINESSES](#)

[TITLE 61 SERIES 12C -WOOD DESTROYING INSECT TREATMENT STANDARDS](#)

[TITLE 61 SERIES 12D -AERIAL APPLICATION OF HERBICIDES TO UTILITY RIGHTS-OF-WAY](#)

[TITLE 61 SERIES 12E -REGISTRY OF PERSONS WITH HEALTH SENSITIVITY TO PESTICIDE DRIFT](#)

[TITLE 61 SERIES 12F -ASSESSMENT OF CIVIL PENALTIES AND PROCEDURES FOR CONSENT AGREEMENT OR NEGOTIATED SETTLEMENT](#)

[TITLE 61 SERIES 12G - GENERAL GROUNDWATER PROTECTION FOR PESTICIDES](#)

[TITLE 61 SERIES 12H -BULK PESTICIDE OPERATIONAL RULES](#)

[TITLE 61 SERIES 12I - NON-BULK PESTICIDE RULES FOR PERMANENT OPERATIONAL AREAS](#)

[TITLE 61 SERIES 12J -INTEGRATED PEST MANAGEMENT PROGRAMS IN SCHOOLS AND DAY CARE CENTERS](#)

[TITLE 61 SERIES 22 - GENERIC STATE MANAGEMENT PLAN FOR PESTICIDES AND FERTILIZERS IN GROUNDWATER](#)

[TITLE 61 SERIES 22A -BEST MANAGEMENT PRACTICES AT TEMPORARY OPERATIONAL AREAS FOR NON-BULK PESTICIDE MIXING AND LOADING LOCATIONS](#)
[CHAPTER 22 ARTICLE 12. GROUNDWATER PROTECTION ACT](#)

In addition to enforcing the above regulations, the Pesticide Regulatory Programs works with the United States Environmental Protection Agency (USEPA) Office of Pesticide Programs (OPP) and the Office of Enforcement and Compliance Assurance (OECA) through a cooperative agreement to enforce the [Federal Insecticide Fungicide and Rodenticide Act \(FIFRA\)](#). As outlined in guidance and written in the agreement, the Pesticide Regulatory Programs works with EPA Region 3 to establish priorities and demonstration of progress towards the protection of water resources from pesticides. This program is known as the Pesticides in Water Program.

The goal of WVDA's Pesticides in Water Program is to ensure pesticides do not adversely affect the nation's water resources. In order to manage pesticides in water the Pesticide Regulatory Programs utilizes a three-tier approach:

1. Evaluate Pesticides of Interest over time to identify pesticides of concern.
2. Take actions (actively manage beyond the pesticide label) to reduce or prevent contamination from pesticides of concern over time.
3. Demonstrate the progress of the management strategy in reducing or maintaining concentrations below reference points.

Tier 1 Pesticides of Interest: Pesticides of interest are those pesticides that have been identified by State Lead Agencies for pesticide enforcement through a survey conducted by the States FIFRA Issues Research and Evaluation Group (SFIREG) in 2005 (Appendix 1). Other pesticides of interest could be added if they cause water quality impairments under the Clean Water Act §303(d) as listed, or become an interest of the West Virginia Department of Agriculture (WVDA).

Pesticides of interest are those pesticides that have the potential to occur in ground or surface water at concentrations approaching or exceeding a human health or ecological reference point. It may be based on a Maximum Contaminant Level (MCL), drinking water health advisory, surface or ground water quality standard (which can address human or aquatic life toxicity), EPA reference dose, EPA drinking water level of concern, or another benchmark adopted by regulation or policy. A pesticide of interest could be an active ingredient alone or the active ingredient collectively with degradates of toxicological concern.

Although sampling is not mandatory it is the best measure to determining active ingredients that should be moved to Tier 2. Securing funds for monitoring pesticide residues in water has been a challenge for WVDA. I am happy to report that WVDA has recently entered into a financial agreement with WVDEP to monitor the States groundwater for pesticides. This 5-year project will test groundwater in vulnerable areas of the state. If pesticide residues are discovered in groundwater as described above, it will allow that active ingredient to be moved to a "Pesticide of Concern".

Tier 2 Pesticides of Concern: Pesticides that are identified as a concern from Step 1 must be managed. A pesticide is actively “managed” when activities are carried out to prevent or reduce contamination of water by a particular active ingredient so that it is prevented from reaching a specified reference point as mentioned above.

An example of a Tier 2 pesticide is the herbicide Atrazine. Atrazine’s widespread use on corn and high solubility in water chemistry led to detections nationwide of the parent compound and its break down products, (also known as degradants) in both surface and ground water.

WVDA relies heavily on public outreach and user education to manage pesticides of concern. The pesticide applicator certification process continuously addresses concerns of pesticides in water. This includes study material supplied for written examinations as well as initial certification training sessions. All commercial applicators using general or restricted use pesticides and all private applicators must maintain certification by attending recertification training sessions. Recertification training sessions are another opportunity to manage pesticides of concern.

Routine agricultural use inspections by Pesticide Regulatory Officers address existing water quality-related label restrictions and State regulations. Adherence to label specified setbacks from surface water and field drainage sites is emphasized. Under the existing enforcement process first time violators are notified by letter. Additional violations can result in monetary fines or license revocation.

WVDA works very closely with the West Virginia Conservation Agency in the promotion of and adoption of voluntary Best Management Practices (BMP) shown to reduce impacts by pesticides. Examples include riparian buffer zones, filter strips and no till cultivation.

Tier 3 Demonstration of progress: After a pesticide has advanced through the first two tiers, progress toward reductions in concentrations below a previously exceeded reference point should be demonstrated in Tier 3. At this stage the steps taken to manage a pesticide of concern in order to keep (or return) pesticide concentrations in water to below a reference point should be outlined or the certification of widespread adoption of control measures should be demonstrated. Progress toward reduction or maintenance of concentrations below the reference point could be demonstrated by:

- ❖ Targeted monitoring of water samples from vulnerable use areas that determines that mitigation measures are preventing residue levels from approaching or exceeded a reference point.
- ❖ Downward trends in concentration levels established by monitoring data in geographic areas where the pesticide of concern is being used (data from WVDA, USGS, registrant, USDA or other sources).
- ❖ The results of targeted surveys or inspections that document the wide adoption of voluntary or regulatory measures which have been proven via research to protect water quality.

- ❖ While monitoring is not required under Tier 3 it is the most representative method of showing a decrease in a particular pesticides occurrence in water. WVDA has historically referenced studies from allied agencies such as the United States Geological Service. In addition, WVDA closely observes the data provided by the West Virginia Department of Environmental Protection's Ambient Water Quality Monitoring (AWQM) Network.
- ❖ Cancellation of a pesticide's use in the state would be the most severe action taken under Tier 3. Historically Tier 3 actions have involved the re-classification of a general use pesticide (as classified by USEPA) to a State restricted use pesticide (RUP). Use of State RUPs require that applicators become certified under state licensing programs before the product can be purchased for use. Other conditions could be placed on the restricted use license such as product specific training program completion prior to renewal of license.
- ❖ WVDA is confident that the uniformity of the development of its environmental programs, the continued interagency cooperation, and the reliance on successfully demonstrated management practices will facilitate the accountability tier of the management program.

Pesticides in Water Program – Reporting Requirements

Activities related to the Pesticides in Water Program are reported under the web based Pesticides of Interest Tracking System (POINTS). POINTS is a national reporting system funded by USEPA and can be found at <http://points.wsu.edu>.

From the POINTS system data, USEPA on a national level expects to be able to:

- ❖ Determine how pesticides of interest were evaluated.
- ❖ Identify pesticides of concern (pesticides that approach or exceed reference points).
- ❖ Identify pesticides of concern that are being actively managed and which may need more effective management at the national level e.g., label changes, special studies.
- ❖ Identify pesticides for which national water quality standards, aquatic life criteria, or other national regulatory standards or reference points are needed.
- ❖ Demonstrate that state and tribal water quality management programs are effective at reducing pesticide risks to water quality locally.
- ❖ Identify states in which the FIFRA lead agency is using its resources to address pesticide impaired waters under CWA §303(d).

Other activities that advance the goal of developing and carrying out programs to protect water resources from pesticide risks:

Plastic Pesticide Container Recycling Program

More than 50,000 lbs. of plastic pesticide containers have been collected for recycling over the last five growing seasons. WVDA maintains pesticide collection container facilities in Berkeley, Greenbrier, Hardy, Hampshire, Kanawha, Lewis, Jefferson, Mason and Ohio counties. Sea containers are rented to store the plastic containers for recycling. The WVDA owns two of the sea containers which has helped reduce the costs of rental units. As this program continues to grow, we hope to offer more pesticide collection facilities in areas where there is heavy pesticide usage. The continuation of this program is a legitimate protection of ground water in that it requires the triple rinsing or pressure rinsing of containers and therefore reduces the number of plastic pesticide containers that may enter the waste stream containing residues of pesticides. Containers are shred and remanufactured into shipping pallets, drainage tile, composite lumber or other low contact nonfood containing plastic items.

Pesticide Waste Disposal Program



Properly rinsed pesticide containers are stored in sea containers at 9 location throughout the state.

The ongoing collection and annual disposal of waste and unwanted pesticides is another program aimed at reducing the potential of pesticides to reach water. In addition to fielding phone calls to pick up unwanted pesticides the program specialist works with the representatives of the West Virginia University Extension Service to contact private pesticide applicators and other State agencies to assist with identifying and inventorying pesticides for disposal. The program specialist has collected and prioritized inventory sheets for the next disposal program and determined what areas need this program. Due to some leadership turnover and budget restraints, the proposal for this year's program has been delayed later than anticipated but it is currently in the process of being reviewed

and finalized. The WVDA is eager to get this next disposal program underway, as there have been an abundance of inventory sheets collected. This program has proven to be very successful in the past and we look forward to the start of our next disposal event.



Waste pesticides collected for disposal.

Groundwater Monitoring Program

In collaboration and with financial support from the WV DEP and groundwater protection fees, we have created a five-year groundwater monitoring program. The objective of this program is to monitor groundwater for pesticides and respond as necessary to manage concentrations that exceed reference points. When residues are found that threaten water quality standards or other reference points, WVDA will respond to pesticide water contamination events by proposing risk mitigation measures with the regulated applicator communities as outlined above. Through compliance assistance and enforcement of pesticide applicator laws and regulations, recertification training requirements WVDA has opportunities for risk mitigation. The groundwater sampling program will begin in January 2018. During the months leading up to the start of the new year, the environmental programs specialist will be visiting various locations throughout the state to determine ten sites to conduct these samples.

Bulk Pesticides Storage Facilities

Bulk pesticides storage facilities are inspected annually. In addition to the secondary containment having an adequate capacity to capture a catastrophic spill the Bulk Operational Rules (§61-12H) require that pumps, transfer lines and other appendages be inspected and maintained in good operational condition and written emergency and discharge response plan be in place. Appropriate enforcement action is taken when facilities are found to be non-compliant.



Secondary containment at a bulk pesticide facility.

Appendix 1

State List of Pesticides of Water Quality Concern

Source: State Survey for Water Resource Monitoring Programs and Analytical Parameters

October 2005 - Conducted by the SFIREG WQ/PD Working Committee

Includes chemicals of concern for both ground and surface water

2,4-D	Isoxaflutole
Acetochlor (+ ESA, OXA)	Lambda-cyhalothrin
Alachlor (+ ESA)	Lindane (Voluntarily cancelled, use of existing stocks permitted until October 1, 2009)
Aldicarb (+ degradants)	Malathion
Atrazine (+ DEA, DIA, DACT, Hydroxy)	Mesotrione
Azinphos-methyl	Metalaxyl
Bentazon	Metsulfuron Methyl
Bromacil	Metolachlor (+ ESA, OXA, S-Metolachlor)
Carbaryl	Metribuzin (+ DA, DADK, DK)
Carbofuran (Cancellation being prepared)	MSMA + other arsenical herbicides
Chlorothalonil	Napropamide
Chlorpyrifos (+ TCP)	Norflurazone (+ degradants)
Clopyralid	Pendimethalin
Copper Pesticides	Phenoxy herbicide group
Dacthal (+ degradants) (Cancellation being Prepared)	Phosmet
DBCP	Picloram
Diazinon	Prometon
Dicamba	Prometryn
Dimethenamid	Propazine
Diuron	Propiconazole
Endosulfan	Simazine (+ DACT, DIA)
Esfenvalerate	Sulfometuron (et. al.)
Ethoprop	Tebuthiuron
Glyphosate (+ AMPA)	Terbacil
Hexazinone (+ Metabolite B)	Thiamethoxam
Imazamethabenz	Tralkoxydim
Imazapyr	Triallate
Imidacloprid	Triclopyr
	Trifluralin

WVDA Regulatory and Environmental Affairs Division Environmental Programs and Environmental Laboratories



The West Virginia Department of Agriculture's Regulatory and Environmental Affairs Division – Environmental Programs section is headquartered at the Moorefield Agricultural Center in Moorefield, WV. This program focuses on monitoring, protecting and improving water quality.

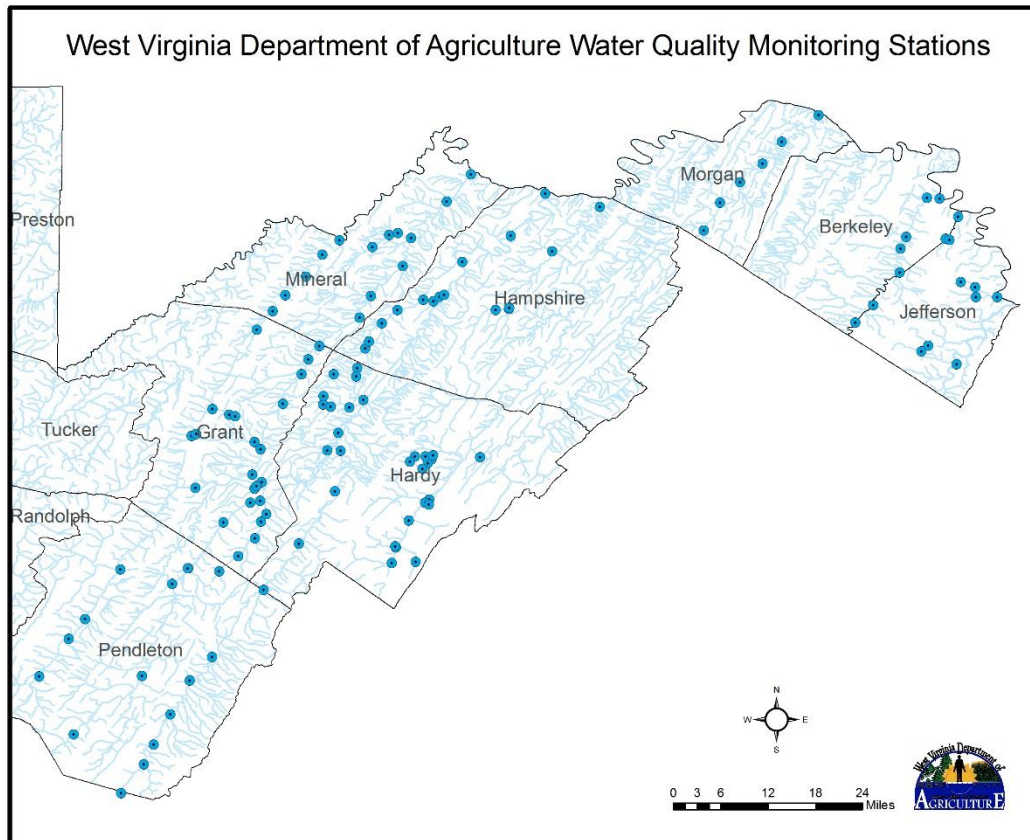
Since the program's inception in July 1998, many of the state's streams in the Eastern Panhandle have been monitored. Today, Environmental Technicians continue to collect approximately 2,800 water quality samples annually in the eight counties that represent West Virginia's Potomac Watershed. Streams sampled include: Anderson Run, Bullskin Run, Cacapon River, Rockymarsh Run, Elk Run, Elks Branch, Lost River, Lunice Creek, Mill Creek (Grant County), New Creek, North Fork of the South Branch, Patterson Creek, Sleepy Creek, Opequon Creek, South Branch of the Potomac River, and South Fork of the South Branch.



Water samples that are collected are analyzed for pH, Temperature, Conductivity, and Dissolved Oxygen in the field, and Nitrate, Nitrite, Ammonia, Orthophosphate, Total Phosphorous, Turbidity, Total Suspended Solids and Fecal Coliform when they are received in WVDA's Environmental Laboratory in Moorefield. Since July 1998, nearly 48,000 water samples have been collected and analyzed.

Due to recent budget cuts and financial constraints, WVDA decided to downsize the water quality program slightly as of July 1, 2017. One of the biggest changes as a result was reducing the number of Environmental Technicians from two to one. Moreover,

WVDA reduced the sampling frequency on certain streams. While Cacapon River monitoring was added in July 2016, there have been a few sampling runs dropped for the 2017-2018 fiscal year. Despite difficult financial times, there are still positive changes taking place such as being able to upgrade some aging field equipment in the upcoming fiscal year using Chesapeake Bay grant funds.



Water quality analysis and related maps of sampling sites are often provided to watershed organizations and state and federal agencies. WVDA utilizes Arc GIS to create these maps. This past year, a data QA process was performed on existing data that will help make it more readily available to other agencies or entities. The Department has recently shared data with groups such as Trout Unlimited and the West Virginia Conservation Agency (WVCA). In fact, WVCA has started a statistical analysis on the water quality data in the Anderson Run, Lost River, South Branch of the Potomac River, and Mill Creek (Grant) watersheds.

One thing that hasn't changed over time is the Environmental Programs staff's ability to work with area farmers to promote best management practices designed to reduce nutrient and sediment runoff and increase farm productivity. New brochures have been created to help inform and promote producers on some of these various practices. The WVDA is continuing to develop a verification program which will help to document expired cost share and non-cost share BMPs that currently exist on agricultural operations.

One of the areas that the Department excels in is its Nutrient Management Program. The Department strongly promotes a Nutrient Management Plan (NMP) as a key best management practice when dealing with nutrient reduction in local waterways. The NMP specifies cropping recommendations for all acreage to which commercial fertilizer, litter, or animal manure is applied. Results of soil tests, coupled with specific crop yields or soil utilization, are used to develop recommendations concerning amounts of fertilizers to be applied to each field. To facilitate Nutrient Management Plan implementation, the WVDA Nutrient Management Laboratory in Moorefield routinely analyzes over 200 litter and manure samples per year. As of 2017, West Virginia proudly announced that it has met its goal of 90,000 acres under Nutrient Management Plans. The nutrient management staff is working diligently to maintain these Nutrient Management Plans for this amount of acreage as the Department continues to expand this program.



Each year the Environmental Programs Section participates in several educational and outreach events each year. These events include local county fairs and festivals in which the staff will educate and inform citizens about topics such as water quality or best management practices. Additionally, staff proactively takes part in Chesapeake Bay workgroup meetings, conferences and forums to understand critical issues while asserting West Virginia's water quality goals.

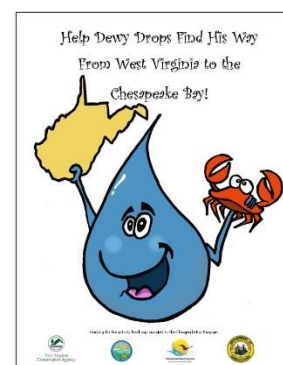


WVDA's Agriculture Outreach Program has been busy with new ideas for bringing environmental education to WV residents. During the past two years, this program has focused more on the importance of soil and water quality by introducing the use of the WV Conservation Agency's Soil Tunnel Trailer. This trailer is a handcrafted re-creation of a soil profile inside an enclosed trailer that makes you feel as if you were walking

into an in-ground tunnel. The purpose of this educational tool is to teach visitors the importance of good soil quality and fertility.

To help promote soil and water quality education to youngsters in another way, the WVDA created a water quality themed coloring-activity book that was geared toward children. This is a great way for kids to have fun and start to become familiar with water quality at home, as well as making the connection to downstream neighbors.

The Outreach Program is continually travelling to various areas of the State to promote soil and water quality education. Some of the prior involvement includes:



Mineral County STEM Day in both 2016 and 2017. Soil Type by Feel and the Soil Tunnel Trailer was the subjects for those years, respectively.

In May at the Mineral County Primary Schools, approximately 525 students were educated on the importance of soil health, water quality and protecting habitats.



This past June, Moorefield was the host for the Summer Ag Institute for Educators. The Soil Tunnel Trailer was present, and the WVDA coordinated a hands-on float trip down the South Branch of the Potomac River for teachers to learn about water quality.

WVDA staff attends 4-H camps and the WV Senior Conservation Camp and works throughout the school year to inform youth about point and non-point source pollution and how pollution affects ground and surface waters. This past summer, there were approximately 100 present at the Hardy County 4-H Camp for campers to learn about habitat protection, soil health, and water quality by means of the Soil Tunnel Trailer.

Furthermore, some the staff also takes an active role in the West Virginia Envirothon. High school students throughout the state come to compete in this event to showcase their knowledge in various subjects such as: forestry, soils, aquatics, wildlife and current environmental topics. This year to aid with the Envirothon, a WVDA staff member submitted a fictional scenario based on Hardy County that was specific about addressing water quality issues on poultry farms.

Through the aforementioned programs, along with a dedicated, hardworking staff, the Department of Agriculture is on the right track for continuing to make a difference in local streams as well as the Chesapeake Bay Watershed.

This is evidenced by consistent excellent scores on certifications, water quality data that is being used by multiple organizations, and the continuing efforts made to educate the public about water quality.

Through unified efforts, the Department will continue to encourage adoption of Best Management Practices to meet the nutrient and sediment reductions required by the Chesapeake Bay TMDL. Moreover, education must continue to inform citizens of all ages on the importance of maintaining a strong agriculture industry while minimizing negative impacts to the environment.

IV. DEPARTMENT of AGRICULTURE

B. West Virginia Conservation Agency

The West Virginia Conservation Agency (WVCA) focuses its resource conservation efforts on the maintenance and/or improvement of water quality relative to natural resource use with a primary focus on agriculture and construction activities. The main concern is for surface water quality but activities impacting groundwater resources are addressed through conservation programs that implement Best Management Practices (BMPs), provide technical support, and involve educational outreach to the citizens throughout the state. The goal is to inspire and empower the people of West Virginia to value and work for clean water.

The WVCA continues its “Conservation Partnerships” with state, federal and local agencies as well as the private sector and many non-profit organizations. This cooperative approach provides benefits such as funding for projects, technical expertise and enables citizen input assisting our agency to pinpoint and target specific problems in specific areas. “Conservation Partnerships” continue to be an effective way to address West Virginia’s concerns and providing the resources vital in the solutions and/or prevention of water quality degradation issues.

Our state has a diversity of terrain and geology that challenges natural resource conservationists with a multitude of issues that must be confronted by methods that are both effective and sensitive to the specific location and individuals affected.

The West Virginia Conservation Agency (WVCA) undertook the following activities which either directly or indirectly protect West Virginia’s groundwater resources during the reporting period of July 1, 2015 through June 30, 2017.

Agricultural Activities

Cost-share programs have been a significant contributor to encourage landowners to develop conservation practices on their property.

- ❖ CREP reporting is completed each federal fiscal year, October 1 – September 30.
- ❖ In FY 15 (October 1, 2014 – September 30, 2015) there were 26 contracts encompassing 188 acres. Of the 188 acres, 41.4 acres were established in filter strips and 146.6 acres were established in riparian forest buffers.
- ❖ In FY 16 (October 1, 2015 – September 30, 2016) there were 18 contracts encompassing 133.47 acres. For this year, some acres were eligible for re-enrollment.
- ❖ Of the 133.47 acres, 5.43 acres were established in permanent grasses and legumes, 54.67 acres (all re-enrolled) are continuing in filter strips, 67.37 acres were established in riparian forest buffers and 6 acres are continuing in riparian forest buffer. FY 17 (October 1, 2016 – September 30, 2017) contract information is expected to be available December 2017.

- ❖ WVCA serves on the WV Nutrient Management Committee that oversees planner certification and develops resource management practices concerning chemical fertilizer, livestock manure and poultry litter utilization.
- ❖ WVCA assisted with 19 agriculture educational field days reaching a total of 3,425 producers, landowners, and agency personnel.

Sediment

In construction assistance, the WVCA reviewed 20 sediment and erosion control plans for construction sites less than one acre in size; facilitating the conservation of an estimated 8,974.83 tons of soil. Plans are reviewed for the appropriate best management practices to prevent sedimentation of the state's waters and underground aquifers.

The WVCA provided technical stormwater management assistance to 20 construction projects by providing recommendations for BMPs to alleviate problem areas. BMPs recommended were rain gardens, overflow, plant materials, bio swales, stream restoration structures, downspouts, outlet/outfall protection, porous pavers, tree planting, subsurface basin, and detention ponds.

Additionally, a total of 36,459 linear feet of severely eroding streambanks were restored saving 12,295.76 tons of sediment from entering the streams and underground aquifers each year. Twenty-one watershed associations throughout the state were provided technical and educational outreach support for sediment and construction related issues.

Management of Organic Animal Waste and Chemical Fertilizers

WVCA serves as a technical resource role on the West Virginia Concentrated Animal Feeding Operations Committee that works to reduce or eliminate the nonpoint source pollution to surface and ground water due to animal agriculture operations. The Committee works on ways to educate farmers, involved in animal agriculture, manage their small operations to prevent water pollution and continue to operate without having to obtain a CAFO permit. Recommendations were developed for the set-back distances for the application of manures and fertilizer to prevent ground and surface water contamination.

# Nutrient Management Plans	BMPs in Plans	# N Managed	#P Managed	Acres
1	1	9,219.71	8,067.25	161.1
1	1	12,899.33	11,286.91	155.8
1	1	6,780	900	54.7
1	1	9,200	3,660	76.5
1	1	20,132.66	16,727.49	All Exported
1	1	3,280	880	31

The Agriculture Enhancement Program (AgEP)

West Virginia Agricultural Enhancement Program's (AgEP) mission is to assist the agriculture cooperators of West Virginia Conservation Districts with the voluntary implementation of best management practices (BMPs) on agricultural lands to conserve and improve land and water quality. The program offers technical and financial assistance as an incentive to implement suggested BMPs.

Practices Completed in FY16		Practices Completed in FY 17	
Practice	Unit Totals	Practice	Unit Totals
Cover Crop	218 acres	Cover Crop	150 acres
Exclusion Fence	70,479 acres	Exclusion Fence	76,658 feet
Frost Seeding	1,512 acres	Frost Seeding	1,306 acres
Heavy Use Protection Areas	44 acres	Heavy Use Protection Area	42 areas/54,420 sq. ft.
Invasive Species Management*	1,320 acres	Invasive Species Management*	1,579 acres
Lime	15,487 acres	Lime	13,286 acres / 31,620 tons
Nutrient Management	2,954 acres	Micro Irrigation	1 system
Pasture Division Fence	167,246 acres	Nutrient Management	3,198 acres
Pasture Seeding	593 acres	Pasture Division Fence	169,909 feet
Pollinator Planting	6 plots	Pasture Seeding	458 acres
Pond Clean Out	7 ponds	Pollinator Planting	3 plots

Roof Runoff Management	5 structures	Pond Clean Out	11 ponds
Urban Agriculture	35 components	Roof Runoff Management	2 structures / 7,154 sq. ft. (structures)
Watering System	100 components/systems	Urban Agriculture	6 components
Winter Grazing	25 acres	Watering System	90 components / systems
<i>*ISM acres include brush acres.</i>		<i>*ISM acres include brush acres.</i>	

Spring Field Day at Mason Run Dairy



Fifty-one natural resource professionals attended a “Spring Field Day” at Mason Run Dairy in Preston County, WV. The training focused on field applications of the new nutrient management planning program “Manure Management Planner” (MMP). The workshop was graciously hosted by Greg Gibson, owner and operator of Mason Run Dairy and the WV Chapter of the Soil and Water Conservation Society in partnership with the WVU Extension Service, NRCS, and WV Conservation Agency. The day was jam-packed with sessions covering field data collection for use in RUSLE and

MMP, GPS use, setback determinations, sampling, and crop rotations. Attendees received 6 nutrient management CEUs and 6 Conservation Planner CEUs.

Educational Activities Specific to Groundwater

CS serves as direct service providers or help coordinate assistance from other sources to watershed organizations and landowners. WVCA supports statewide efforts to address nonpoint pollution with education and outreach, coordination and implementation of projects addressing runoff, erosion and sediment control, stormwater management, nutrient and pest management, stream cleanup, riparian demonstrations, stream bank stabilization, pre and post project monitoring, watershed assessments, agriculture BMP selection and installation, the availability and types of conservation programs, financial assistance, and water quality improvements.

WVCA held 73 educational programs attended by 4,836 students, members of the public, producers, agency personnel and watershed association members. Fourteen stormwater workshops were held across the state reach a total of 391 attendees. WVCA is still leading the WV SOS monitoring on 89 stations on 55 streams.

HFMS water testing



WVCA Conservation Specialist assisted a Harpers Ferry Middle School science class with their Water Quality Monitoring program by leading the 7th grade class through a benthic macro invertebrate survey. HFMS science teacher, Dr. Robin Good does water testing and biological surveying with her students on Elks Run monthly.

Aquatics Envirothon Trainings

EPCD held their semi-annual Envirothon Training, at which WVCA Conservation Specialist Suzy Campbell conducted the aquatics portion of the training. Thirty-nine students and teachers from 5 different schools received training in water chemistry, aquatic habitat, biological assessment, water quality laws and regulations and other sub-topics. Additionally, the conservation specialist assisted with the pre-test day aquatics training at the state Envirothon competition, which hosted a total of 25 teams with 3 alternates.



STEM Festival – Soil Trailer

Potomac State College hosted their annual STEM festival. WVCA Conservation Specialist attended with the soil tunnel trailer open to the public. The 100% ADA compliant unit has sculpted interior walls with the left 16' wall serving



as the Soil Health Wall, with the right wall serving as an agricultural Specialty Crops Wall. At 8' wide, the back wall serves as a Water Quality Wall. The left side of the back wall depicts clean water with healthy fish, lily pads, crawdad and a duck floating from the ceiling. The right side depicts the effects of litter and contamination. Showing sickly wildlife and litter (tire, 10-gallon drum, plastic bottles). The "pond" sculpture comes from the wall and

onto the ceiling where the duck is swimming and roots from the lily pads hang down. Students and parents could pick up bookmarks, stickers and flower seeds

after they took a walk through the trailer and were given the chance to ask questions regarding the artwork. Approximately 400 people toured the trailer during the festival.



Stormwater management

WVCA provides technical advice regarding stormwater management quality and/or quantity issues to clients throughout the state. The primary method to control stormwater discharges is the use of best management practices (BMPs). WVCA provided 356 clients with a variety of BMP recommendations to control runoff. BMPs recommended included: tree plantings, swales, rain gardens, permeable pavers, wetlands, articulated blocks, vegetation plans, bioretention structures, erosion matting, stone berm, filter strips, rainwater harvesting, streambank stabilization, diversion ditch, culvert outlet, culvert inlet protection, grading slopes, check dams, channel lining, detention pond, and increasing concentrated flows with increased stand of grass or herbaceous material on a critical area.

WVCA actively promoted the use of rain water harvesting throughout the state with 14 rain barrel workshop with approximately 391 attending. Rainwater harvesting is the accumulation and deposition of rainwater for reuse on-site, rather than allowing it to runoff. A rain barrel is a system that collects and stores rainwater from your roof that would otherwise be lost to runoff and diverted to storm drains and streams.

Additional stormwater projects

WVCA Conservation Specialist Functions as 319 Watershed Project Managers

WVCA's Conservation Specialists (CS) support volunteer watershed associations, educate citizens on non-point source pollution issues, identify local stakeholders, partners and funding sources, and take the lead for Project Teams (PTs) consisting of community stakeholders to place projects on the ground. Watershed Project Proposal funds are used to install specific projects designed to remedy or decrease contributions to the impairment of the priority watershed in which the projects are installed.

Programs and Projects provided by WVCA in the following project areas:

Sleepy Creek II 319 Watershed Project - Morgan County

The goal of the Sleepy Creek Phase II 319 Watershed Project is to reduce fecal coliform loads within the watershed from failing septic systems. Projects completed 7/1/15-6/30/17 include:

- ❖ Installation of Porous Pavers
- ❖ Urban Tree Plantings
- ❖ Riparian Buffer
- ❖ Installation of Rain Garden

Sleepy Creek III 319 Watershed Project - Morgan County

The goal of the Sleepy Creek Phase III 319 Watershed Project is to reduce fecal coliform loads within the watershed from stormwater runoff from urban agricultural land uses. Projects completed between 7/1/15-6/30/17 include:

- ❖ 59 septic systems pumped
- ❖ 4 septic systems repaired
- ❖ Outreach and Education

Elks Run 319 Watershed Project - Jefferson County

The goal of the Elks Run 319 Watershed Project is to reduce fecal coliform and sediment loads within the watershed from failing septic systems and eroding streambanks. Projects completed between 7/1/15-6/30/17 include:

- ❖ Water Quality Monitoring and USGS source tracking
- ❖ Outreach and education

Back Creek Protection Watershed Project - Berkeley County

Developed EPA approved Watershed Protection Plan to guide and prioritize conservation and restoration efforts in Back Creek Watershed between 7/1/15-6/30/17 include: Outreach and Education

Muddy Creek 319 Watershed Project - Greenbrier County

The goal of the Muddy Creek 319 Watershed Project is to reduce the fecal coliform loads within the watershed from agricultural operations and failing septic systems. Best Management Practices installed include 5,486 feet of pipeline, 10 watering systems, 2 ponds, 1 well, 1 pumping system, 7,027 feet of exclusion fence, 1,290 feet of division fence, 2 heavy use area protections, 9 septic pumpings, 2 septic replacements, 72 acres of nutrient management plans and 72 acres of grazing plans impacting 275 animals with a bacteria load reduction of 2.53E+12. Other projects completed to date include:

Howards Creek 319 Watershed Project - Monroe County

A critical area planting done on 1 acre of land and one constructed wetland installed.

Knapps Creek 319 Watershed Project - Monroe County

Best Management Practices (BMPS) installed include 265 feet of pipeline, 2 watering systems, 3,518 feet of exclusion fence, 957 feet stream restoration, 2 heavy use area protections, 15 septic pumpings and 10 septic replacements impacting 160 animals with a bacteria load reduction of $1.39E+12$ and a sediment load reduction of 394.74 tons.

Milligan Creek 319 Watershed Project - Greenbrier County

Best Management Practices installed include 8,069 feet of pipeline, 20 watering systems, 2 ponds, 1 well, 4 pumping systems, 4,355 feet of exclusions fence, 28,231 feet of division fence, 6 heavy use area protections, 1,382 acres of nutrient management plans and 1,091 acres of grazing plans impacting 1,496 animals with a bacteria load of $1.3E+13$.

James River 319 Watershed Project - Monroe County

Best Management Practices installed include 10,506 feet of pipeline, 15 watering systems, 1 spring development, 2 ponds, 1 well, 1 pumping system, 25,996 feet of exclusion fence, 4,845 feet of division fence, 900 feet of stream restoration, 15 heavy use area protections, 739 acres of nutrient management plans, 472 acres of grazing plans and 1 roofed feeding area impacting 545 animals with a bacteria load reduction of $4.62E+12$.

Second Creek 319 Watershed Project – Monroe County

Best Management Practices installed include 2,662 feet of pipeline, 7 watering systems, 1 spring development, 1 pond, 2 wells, 3 pumping systems, 794 feet of exclusion fence, 17,011 feet of division fence, 8 heavy use area protections, 935 acres of nutrient management plans, 707 acres of grazing plans, 1 roofed feeding area impacting 1,726 animals with a $1.5E+13$ bacteria load reduction.

Upper Meadow 319 Watershed Project – Greenbrier County

Best Management Practices installed include 440 nutrient management plans impacting 525 animals.

Sewell Creek 319 Watershed Project – Greenbrier / Fayette County

Additional Best Management Practices installed in the Greenbrier Valley Conservation District include 1,136 nutrient management plans impacting 850 animals.

Program Environmental Goals - The environmental goals of the 319 Watershed Projects in the Greenbrier Valley are to improve water quality by reducing the source of fecal coliform bacteria from entering waterways. Watersheds where TMDLs have indicated high impairments are targeted and numerous BMPs are installed.

Protection of Public / Private Water Supplies – Second creek is the source for water through much of Monroe County and has been targeted in tributaries where there is a tremendous livestock presence.

Challenges Faced – Landowners perception of Best Management Practices is the most challenging obstacle to overcome.

WVCA Is a Full Partner In The Chesapeake Bay Program. Chesapeake Bay Efforts Include:

The West Virginia Chesapeake Bay Program is an effort by the West Virginia Conservation Agency, West Virginia Department of Environmental Protection, West Virginia Department of Agriculture, and several other state, federal, and local partners to implement the Chesapeake Bay Total Maximum Daily Load (TMDL), released by EPA on December 29, 2010.

The Chesapeake Bay TMDL is a comprehensive “pollution diet” to restore the health of the Bay and all of its tributary streams, creeks, and rivers by setting limits for nitrogen, phosphorous, and sediment pollution. The TMDL is historic in that it is the largest clean-up ever initiated by EPA, encompassing a 63,000-square mile watershed. It is designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025, with at least 60% of pollution reductions completed by 2017. West Virginia is charged with reducing nitrogen by 33%, phosphorous by 35% and sediment by 6% across all sectors. Each of the six Bay states and the District of Columbia have developed Watershed Implementation Plans (WIPs) that detail how and when they will meet their pollution allocations.

West Virginia released its Phase II Watershed Implementation Plan (WIP) on March 30, 2012 and is already gearing up to develop its Phase III WIP in 2018, which will address reductions needed from 2018-2025. The WIP describes how federal, state, and local governments will achieve required pollution load reductions and sets a timeline for when reductions will occur. It describes in detail how pollution reduction strategies will be undertaken in each major load sector: Wastewater, Developed Lands, Agriculture, Forest, and Other. Reducing nitrogen, phosphorous, and sediment in local creeks and rivers will mean healthier water resources to better sustain tourism, fishing, drinking water supplies, wildlife habitat, and other uses.

Agricultural BMP Implementation

Chesapeake Bay Implementation Grant funds have been allocated to assist agricultural producers with the installation of cover crops, stream bank exclusion fencing, alternative watering sources, riparian buffer development, heavy use area protection around areas such as feeding and watering troughs and walkways, and the transfer of poultry litter outside of the Bay watershed. With the assistance of these funds, WVCA and conservation districts have helped the state reduce nutrient and sediment loads from entering the state’s streams, rivers, and the Chesapeake Bay Watershed through the implementation of BMPs.

A total of 9,916.7 acres of cover crops were planted during this time. Cover crops improve water quality by reducing soil erosion and nutrient runoff. Some examples of cover crops are barley, rye, alfalfa and triticale. Often, when farmers harvest their cash crops (corn, soy beans, etc.), the fields will lay bare in the winter. By establishing a cover crop during the winter months, the soil is held in place as opposed to being washed off of the field into streams and rivers during heavy rains. Producers are able to improve their operations while addressing environmental concern.

Additionally, 9,514.9 tons of poultry litter were transferred out of the watershed! The Potomac Valley is rich with poultry production, and therefore has a large surplus of poultry litter. Transferring this litter out of the watershed prevents many nutrients from running off into rivers and streams.

Nutrient Management

Nutrient management is the science and practice directed to link soil, crop, weather, and hydrologic factors with cultural, irrigation, and soil and water conservation practices to achieve optimal nutrient use efficiency, crop yields, crop quality, and economic returns, while reducing off-site transport of nutrients (fertilizer) that may impact the environment. Nutrient management plans are tailored to be farm specific and require the knowledge of local planning professionals. WVCA works in partnership with the West Virginia Department of Agriculture to promote NMP adoption by certifying staff to write plans, employing summer interns to assist farmers in pulling soil and manure samples and providing educational events.

During 2015, 2016, and 2017, The West Virginia Conservation Agency sampled over 10,085.5 acres for nutrient management plans.

Stormwater Management

Managing stormwater and controlling sediment and erosion are both tasks that WVCA is charged with. During this time period, 2 rain gardens and 1 swale were installed in the Elks Run watershed in Jefferson county as part of a pilot program to promote the adoption of rain gardens by residential landowners.



Water Quality Workshops CREP

The West Virginia Conservation joined with the USDA Farm Service Agency and other signatories to organize a two-day comprehensive CREP training for all partnering field staff on May 3 & 4, 2016. The training targeted federal and state field employees who play a role in the program within West Virginia's Chesapeake Bay drainage. The goal of the training was to increase communication and define roles between partners, train new staff and provide updates on environmental challenges in the area and how West Virginia producers are obligated to meet these requirements.



Stormwater Rain barrels are an excellent way to collect rain water from rooftop runoff and prevent it from contributing to storm water that carries pollutants into streams and rivers. They also provide free irrigation for gardens and lawns and can reduce utility bills while conserving water and preventing runoff. A rain barrel workshop was held at the Berkeley Springs Senior Center on October 12, 2016 at which there were 15 total attendees and 10 members of the senior center received rain barrels. Sleepy Creek Watershed Association publicized the workshop to their membership and non-senior center members as well.



Come learn about rain barrels [View this email in your browser](#)

Sleepy Creek Watershed Association

Rain Barrel Workshop!

In partnership with the Berkeley Springs Senior Center and the Eastern Panhandle Conservation District, SCWA is sponsoring a rain barrel workshop Wednesday, October 12. The workshop will begin at 9:30am and all interested SCWA members are invited to attend.

Rain barrels are a practical way to reduce stormwater runoff into Sleepy Creek, and provide a water source for gardening. Installation kits for use at your homes will be available at any time following the workshop at the Conservation District office in Martinsburg for \$40 per kit. Any questions can be referred to Suzy Campbell, EPCD, at 304-263-4378, ext 3.

SCWA Mission Statement
Protect the integrity of the Sleepy Creek Watershed and educate and assist responsible members. In keeping this scenic estate, wildlife preserves for current and

The West Virginia Conservation Agency's Watershed Resource Center

The Watershed Resource Center (WRC) focuses resources on providing training, information transfer, and assistance on all aspects of water quality efforts throughout West Virginia. WRC provides specific training and educational needs to better understand watershed and nonpoint source and point source impacts and solutions.

The WRC hosts a session annually at the WV Contractors Exposition. In 2015 & 2016, the session was attended by 25+ contractors and professionals in 2015 and 125+ attendees in 2016. A session of "Potential Pitfalls Associated with Construction Related to Oil and Gas in the Northwest Region of West Virginia" was presented by Tonya Mather, Environmental Inspector Supervisor, WVDEP and Rick Adams, Technical Analyst Associate, WVDEP. The WRC presented an educational display and workshop geared toward these potential pitfalls. The workshop was a one-hour session with 1 CEU/PDH credit on Permit No. WV0116815 – Stormwater Associated with the oil and gas industry and other issues that may arise on a permitted construction site and what to do (i.e. reporting spills, inadvertent returns of drilling mud, etc.)

The WRC provides annual support to the Annual Mid-Atlantic Chapter of International Erosion Control Association Environmental Conference, Workshop & Trade Show. The MAC/IECA disseminates information to over 200 members and public attendees in the fields of sediment and erosion control, stormwater management, wetland mitigation, and stream stabilization through technical workshops and the attendance of approximately 25 vendors at their annual conference.

The WRC provides educational outreach on nonpoint source pollution at educational field days, community events, and expositions. During this reporting period, the WRC presented water quality education for 5 youth camps.

Educational material on water quality and nonpoint source pollution is distributed statewide as requested.



V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

A. Office of Oil and Gas

The Office of Oil and Gas (OOG) regulates West Virginia's oil and natural gas industry. Protection of groundwater is of utmost importance and is achieved through the permitting, inspection and enforcement of exploration, production, plugging and injection activities of the industry. Over 62,000 active wells are maintained by the OOG. Regulations aimed at protecting groundwater have been in existence since 1929. Additional regulations have been added in subsequent years to further aid in the protection of groundwater. The OOG believes that groundwater protection is maximized by conforming to these existing regulations and practices. The following is a summary of selected regulatory functions and activities the OOG conducts in protecting groundwater.

Fresh Water Casing and Drilling Practices- 35 CSR 4-11.3; 35 CSR 8-9.2

For conventional wells, operators must set fresh water casing at least 30 ft. below the deepest fresh water horizon and circulate cement to surface prior to drilling into any oil, gas or salt water bearing strata. With the passage of W. Va. Code § 22-6A, the Horizontal Well Act, in December 2011, and its corresponding legislative rule, 35CSR8, going into effect in July 2013, at least 300 ft. of freshwater casing must be run and cemented to surface on applicable horizontal wells, known as H6A wells. The freshwater casing may be extended deeper to cover known aquifers or to cover a coal seam prior to drilling below sea level (elevation) and must always be cemented to surface. The operator must also employ practices and procedures necessary to minimize damage or disturbance to strata including groundwater until casing has been set.

Plugging Methodology – 35 CSR 4-13 and W. Va. Code § 22-6-24

During plugging and abandonment operations of a well, the operator is required to separate oil, gas and water-bearing strata with 100 foot cement plugs to completely seal the hole and prevent communication with other zones, including groundwater.

Water Supply Testing- 35 CSR 4-19 and 35 CSR 8-15

For conventional wells, operators are required to notify landowners within 1,000 ft. of a proposed drill site for a well. At the request of the landowner, the operator shall sample and analyze water from any wells or springs within this 1,000 ft. radius. If no requests are made, then the operator shall choose an existing well or spring from within the 1,000 ft. to sample and analyze. Operators are required to move out to 2,000 ft. if there are no wells or springs within 1,000 ft. Sampling parameters include, but are not limited to pH, iron, chlorides, total dissolved solids and detergents (MBAS). Results are to be submitted to the landowner as well as the OOG. Results are kept on file for groundwater quality purposes should a problem ever arise.

The operator shall sample and analyze water from any existing water wells or developed springs within 1500 ft. from the center of the proposed pad for all wells permitted under W. Va. Code § 22-6A. Under 35 CSR 8-15.3.b, the Chief can require the

operator to sample and analyze out to 2000 feet. parameters include, but are not limited to: total petroleum hydrocarbons (GRO, DRO,ORO), BTEX, chloride, sodium, total dissolved solids (TDS), aluminum, arsenic, barium, iron, manganese, pH, calcium, sulfate, detergents (MBAS), dissolved methane, dissolved ethane, dissolved butane, dissolved propane, and bacteria (total coliform).

Underground Injection Control Program – 35 CSR 4-7

The OOG administers the Underground Injection Control (UIC) Program for Class II and III injection wells. Class II wells include brine disposal and secondary recovery gas and water injection wells. Class III wells include solution mining wells. The current active inventory of Class II and III wells consists of approximately 33 private and 12 commercial brine disposal wells, 446 secondary recovery wells and 12 solution mining wells. The primary focus of this program is the protection of groundwater from injection operations.

During the permitting process, operators are required to sample and analyze all water wells, springs and surface water bodies within at least a quarter-mile radius of the injection well or facility. Solution mining permits further require that groundwater be sampled, analyzed and charted on a quarterly basis. To ensure well integrity, mechanical integrity tests (MITs) are required to be conducted on every injection well by the operator at least once during the 5-year permit term to ensure that injected fluid is not migrating into any Underground Source of Drinking Water (USDW). Operators are required to submit reports monthly of daily activity for each injection well.

Abandoned Well – 35 CSR 6

Abandoned wells are the most problematic regulatory area relating to groundwater, especially for wells drilled 75 to 100 years ago when technology and concern for groundwater protection were not as advanced as today. These wells, which are found throughout the state, now pose potential and actual threats to groundwater quality, as aquifers penetrated by these wells are typically not cased to protect them from contaminants within the borehole of the well. Some of the typical contaminants that may affect groundwater quality include hydrocarbons, chlorides and metals. The OOG works with both industry and the federal government to locate, prioritize and plug or produce abandoned wells. The OOG has a priority ranking of abandoned wells and those that pose a significant and/or immediate threat to human health or the environment are scheduled for evaluation first.

Annual Inspection – 35 CSR 4-11.6

Operators are required to visually inspect all their unplugged wells on an annual basis. Any significant leakage or well integrity failure is to be reported to the OOG and measures should be taken to remedy the problem. Operators are required to submit certification to the OOG that the inspections have been conducted.

General Water Pollution Control Permit, GP-WV-1-88, GP-WV-1-07

The primary function of the land application general permit, GP-WV-1-88, is the prevention of pollution to the waters of the state relating to the handling and disposing of

drilling wastes. Operators applying for a conventional well work permit involving the use of a pit for holding wastes generated during well work must also register this site and indicate the method for treating and disposing of the pit contents. If land application is the chosen method of disposal, a groundwater protection plan (GPP), must be filed as part of the permit packet. Generally, most pit contents (excluding those generated from an H6A well) may be land applied after proper treatment and aeration procedures.

Another general permit, GP-WV-1-07, allows for produced water from certain coalbed methane wells to be applied directly to the ground. To qualify for coverage under this permit, candidate wells must meet strict water quality criteria. Analyses of surface water, and in some cases, groundwater, must be presented to OOG on a semi-annual basis for review.

Spill Prevention and SPCC Plans 35 CSR 1

To prevent discharged oil from reaching waters of the state, all operators are to have adequate containment or diversionary structures in place at each well or facility. Operators are also required to have a Spill Prevention Control Countermeasure (SPCC) Plan for these facilities. This requirement was devised as a result of the passage of the Clean Water Act (CWA) to protect waters of the state from discharged oil.

Miscellaneous

The OOG investigates numerous water well contamination cases yearly. Sampling and analytical work have become routine tasks during such investigations. Parameters vary from case to case, but usually at a minimum, include those which have already been mentioned. The analyses are submitted on paper and kept in the corresponding investigation file.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

1. Office of Waste Management - Solid Waste Permitting Unit (SWPU)

The SWPU regulates solid waste facilities under the Solid Waste Management Rule, 33CSR1. This includes the review of applications for various permitting activities for new and existing facilities such as permit issuance, renewal, or closure. The SWPU reviews applications to accept special waste, to alter groundwater monitoring systems, and also reviews statistical groundwater monitoring reports, conducts construction quality assurance and quality control inspections, and compliance assistance to waste generators.

Description	Permitted Facilities
Active Municipal Solid Waste Landfills (Class A & B)	18
Closed Municipal Solid Waste Landfills (Class A & B)	33
Construction/Demolition Waste Facilities (Class D and D-1)	21
Yard Waste Composting Facilities	23
Transfer Stations	18
Waste Tire Facilities	3
Recycling Facilities (Class E)	9
Sewage Sludge Processing Facilities	0
Mixed Waste Processing Facilities	1

Permitted landfills must sample groundwater-monitoring wells twice each year and perform statistical tests to determine whether groundwater has been contaminated. The statistical reports are reviewed by the SWPU and the Office of Environmental Enforcement (OEE) takes any necessary enforcement action.

In an effort to protect groundwater, the Solid Waste Management Rule requires an impermeable liner system for solid waste municipal solid waste landfills. This multiple layer liner system includes a leak detection zone that will alert the facility should there be a failure in the liner. If contamination has been detected by routine detection monitoring, the landfill may be required to begin corrective action to clean up the groundwater.

Although some releases have been detected, the statistical groundwater-monitoring program is in need of improvement. The Division of Water and Waste Management (DWWM) has compliance section to monitor groundwater sampling and analytical data has been verified through split sampling. The facilities are notified in writing for any improvement to sampling. As improved statistical methods are introduced, contamination caused by poor sampling techniques will become more apparent.

Groundwater monitoring wells must sometimes be replaced because they have caved in, gone dry, or are located where the disposal area is expanding. The SWPU reviews well replacement plans to ensure that the new wells are properly placed to detect potential groundwater contamination as soon as possible.

Groundwater monitoring reports are submitted to the SWPU on paper. The Integrated Regulatory Information Support system (IRIS) which is being developed by WVDEP, will accept groundwater-monitoring data electronically and provide an interface to statistical and mapping software that will allow the SWPU to check statistical calculations.

The proper management of waste reduces the likelihood of groundwater contamination by reducing the amount and controlling the types of contaminants in leachate. This is achieved by special waste requests which are reviewed by the SWPU and either approved or denied for disposal.

The SWPU is responsible for ensuring that facilities are properly designed by reviewing plans and granting permit modifications for expansion. During construction at these facilities, the SWPU conducts quality assurance/quality control (QA/QC) inspections to assure that facilities are built according to specifications and accepted industry practices. Five landfill Facilities are currently allowed to accept drilling cutting and associated drilling waste (Under Solid Waste Rule 33CSR 1) for disposal. Modifications are required to the facility permit to monitor the leachate separately through dedicated wells and being treated by the POTW (Publicly Own Treatment Works).

Oil and other chemicals, primarily from vehicles, and leachate can contaminate storm water flowing from solid waste facilities. Plans for structures and procedures for managing storm water are a part of the detailed plans reviewed by the SWPU. Proper design, construction, and management prevent contaminated storm water from infiltrating into the groundwater.

Through the Landfill Closure Assistance Program (LCAP), the WVDEP is currently monitoring the 33 closed solid waste landfills in West Virginia. Under this program, the emphasis is on the capping of these facilities to minimize groundwater impact. Active solid waste landfill facilities have an on-going program to identify and address any groundwater releases. The LCAP Program utilizes consultants who follow the procedures outlined in 33CSR1 to sample, analyze, and identify groundwater and any associated problems. The SWPU has assisted LCAP by providing geological assistance on program priorities.

B. Division of Water and Waste Management

2. Hazardous Waste Permitting Section

The Hazardous Waste Permitting Unit (Permits) was established by Chapter 22, Article 18 of the West Virginia Code and the rules promulgated there under. Legislative Rule, Title 33, Series 20, known as the Hazardous Waste Management System (HWMS), are the regulations promulgated to regulate the storage, treatment, and disposal of hazardous wastes generated and managed in West Virginia. The HWMS has incorporated by reference the Code of Federal Regulations (CFR) promulgated under the Resource Conservation and Recovery Act (RCRA) amendments of 1984. All provisions of 40CFR264 Subpart F and 40CFR265 Subpart F, which pertain to groundwater protection and any releases from a Solid Waste Management Unit (SWMU), have been incorporated by reference in their entirety.

Permits and the State of West Virginia coordinate this regulatory effort with the EPA. In general, as a summary of the relationship between the two agencies, West Virginia has authorization to assume the lead role in the groundwater protection and monitoring at the permitted units in West Virginia while EPA has the lead for implementing corrective action activities.

Groundwater Protection Goal and Priorities

The goal of Permits is to identify all permitted sites with groundwater contamination or potential for groundwater contamination due to a release, remediate the site, and return the site to its original condition.

The priority objectives are as follows:

- ❖ Identify all sites with contaminated groundwater or potential for groundwater contamination.
- ❖ Define the contaminants, source, and extent of contamination.

All RCRA facilities will have chosen remedies and remediation, and construction completion by 2020, with contamination under engineering control and stabilized to prevent additional contamination to groundwater and eliminate further migration of contaminated groundwater.

Mechanisms to Regulate and Protect Groundwater at Permitted Units

The Groundwater monitoring regulations in 40 CFR Part 264/265, Subpart F, is one part of an overall strategy to reduce the likelihood of environmental contamination resulting from hazardous waste treatment, storage, disposal and any SWMU under the Corrective Action Program. This strategy includes restrictions on disposal of untreated hazardous waste, unit-specific standards for land-based hazardous waste management units, and monitoring groundwater below these units. The land disposal restrictions program requires the treatment of hazardous wastes before disposal to reduce the mobility or toxicity of hazardous constituents. The unit-specific standards for land-based

hazardous waste management units seek to prevent the release of hazardous waste to the environment.

Groundwater monitoring is the final link in this strategy to prevent environmental contamination. Owners and operators of all land-based units must institute a groundwater program that is able to detect and characterize any releases of hazardous waste or hazardous constituents to the groundwater underlying the facility. Should the other elements of the strategy fail, groundwater monitoring will detect the release so it can be remedied.

The regulations in Subpart F of Part 264/265 are general requirements, establishing performance-based standards that state what a successful groundwater monitoring program must accomplish; they do not dictate specific technical standards. Each facility's groundwater monitoring program is unique because no two Treatment, Storage, or Disposal Facilities (TSDF) are the same. Individual groundwater monitoring programs are based on site-specific conditions, including the underlying geology and hydrology, contaminants in the groundwater, as well as the properties of wastes managed on site.

Regulatory authority is available to require the owner and operator of a TSDF to remediate releases of hazardous waste or hazardous constituents to the environment. All permitted facilities must comply with Part 264, Subpart F, for releases from SWMUs. There are three stages to the Part 264, Subpart F, groundwater monitoring and follow-up activities:

- ❖ Detection monitoring - to detect if a release has occurred
- ❖ Compliance monitoring - to determine if regulatory standards have been exceeded once a release has occurred
- ❖ Corrective action - to remediate a release to the groundwater

Section 264.97 sets out the basic requirements that apply to all groundwater monitoring programs under Part 264, Subpart F. The specific requirements that apply to each of the three phases of groundwater monitoring are found in section 264.98, 264.99, and 264.100.

The general requirements for groundwater monitoring programs at permitted facilities are found in Subpart 264.97. These general requirements apply to all three phases of groundwater monitoring: detection monitoring, compliance monitoring, and corrective action. A groundwater monitoring program established pursuant to Part 264, Subpart F, must have a sufficient number of monitoring wells, installed at appropriate locations and depths, to yield water samples that:

- ❖ Represent the background conditions of the site
- ❖ Represent the quality of groundwater passing the point of compliance
- ❖ Detect any contamination of the uppermost aquifer at the point of compliance

The goal of a detection monitoring program is to detect and characterize any release of hazardous constituents from a regulated unit into the uppermost aquifer. The detection monitoring system must be installed at the point of compliance and adhere to the task requirements applicable to all groundwater monitoring systems. The owner and operator must monitor for certain indicator parameters and any other specific waste constituents or reaction products that would provide a reliable indication of the presence of hazardous constituents in groundwater at the point of compliance.

Once it is established that a release has occurred, the owner and operator must institute a compliance-monitoring program. The goal of the compliance-monitoring program is to ensure that the amount of hazardous constituents released into the uppermost aquifer does not exceed acceptable levels. Once those levels are exceeded, the owner and operator must initiate corrective action. The compliance-monitoring program establishes routine monitoring (at least semi-annually).

The goal of the Subpart F corrective action program is to bring regulated units and/or SWMU back into compliance with the required standards at the point of compliance. The Subpart F corrective action program seeks to accomplish this goal by requiring that the owner and operator either remove the hazardous constituents or treat them in place. Examples of corrective measures include excavation, stabilization, solidification, and source control. The owner and operator must also conduct corrective action to remove or treat in place any hazardous constituents that exceed the required standards between the point of compliance and the down gradient property boundary, and beyond the facility boundary where necessary to protect human health and the environment.

Mechanisms for Corrective Action

The Hazardous and Solid Waste Act of 1984 (HSWA) required corrective action for all releases of hazardous waste or constituents from any SWMU at a facility seeking a permit regardless of when the waste was placed in the unit. A SWMU is any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. This definition includes any area at a facility where solid wastes have been routinely and systematically released. This authority is applied to any facility seeking a permit, including operating permit, post-closure permits, and permits-by-rule after November 8, 1984.

Under HSWA, Congress also gave EPA the authority to issue orders requiring cleanups at interim status facilities. For interim status TSDF's that were already in operation when the applicable RCRA standards were established, and that are operating under the standards in 40 CFR Part 265 until they receive a permit Under 3008(h), as added by HSWA, the EPA can issue an administrative order or file a civil action whenever it determines, on the basis of any information, that there is or has been a release of hazardous waste into the environment from the facility. This applies to facilities that are currently operating under interim status, that formerly operated under interim status, or that should have obtained interim status. It also applies to any release of hazardous waste or constituents from the facility. In addition to requiring cleanup, EPA has the authority under 3008(h) to revoke or suspend interim status. Finally, as with 3004(v), EPA

may use 3008(h) to require corrective action beyond the facility boundary and to require proof of financial assurance for cleanup.

One of the keys to understanding the RCRA corrective action program is knowing when a facility becomes subject to the corrective action. A facility can enter the corrective action program in one of primarily four ways. Facilities can enter the corrective action program under statutory authorities, by enforcement orders, by volunteering to perform cleanups, or after detecting statistically significant increases of contamination according to the groundwater monitoring requirements in 40CFR264, Subpart F.

In the past, EPA has used the corrective action process to evaluate and document the nature and extent of contamination, identify the physical and geographic characteristics of the facility, and identify, develop, and implement appropriate corrective measures. The conditions at contaminated sites vary significantly, making it difficult to adhere to one rigid process. Consequently, the corrective action process is designed to be flexible.

The original corrective action process of investigation and remedy selection and implementation comprise several activities. These activities are not always undertaken as a linear progression toward final facility cleanup, but can be implemented flexibly to most effectively meet site-specific corrective action needs. These activities are:

- ❖ RCRA Facility Assessment (RFA) - identifies potential or actual releases from SWMUs
- ❖ Interim/Stabilization Measures - implements measures to achieve high-priority, short-term remediation needs
- ❖ RCRA Facility Investigation (RFI) - compiles information to fully characterize the release
- ❖ Corrective Measures Study (CMS) - identifies appropriate measures to address the release

Once the implementing agency has selected a remedy, the facility enters the corrective measures implementation (CMI) phase of corrective action. During the CMI, the owner and operator of the facility implement the chosen remedy. This phase includes design, construction, maintenance, and monitoring of the chosen remedy, all of which are performed by the facility owner and operator with agency oversight.

A remedy may be implemented through a phased approach and phases could consist of any logically connected set of actions performed sequentially over time or concurrently at different parts of a site.



















Facilities with On-going Corrective Action

The following chart lists the West Virginia facilities that are currently performing corrective actions. It lists the facility, if the facility has human health (HH) and groundwater (GW) under control, and where each facility stands with its cleanup status.

This chart is periodically updated and can be viewed on the Internet at:

<https://www.epa.gov/hwcorrectiveactionsites>

Additional information can be seen about site history and project detail if you go to the web site and click on the facility name.

West Virginia RCRA Baseline Facilities EPA Region 3					
Facility fact sheets and the Environmental Indicator forms are Adobe Acrobat PDF files. 					
For additional facility information, go to the following links:					
<ul style="list-style-type: none">• Click on the facility name to view the facility fact sheet• Click on the "YES" to view the facility's completed Environmental Indicator form• Click on the location name to view a map of the area					
 Cleanup Initiated		 Complete Without Controls			
 Remedy Selected		 Complete With Controls			
 Construction Complete					
Facility Name	EPA ID#	Location	Environmental Indicators		Cleanup Status
			HE	GW	
AEP Kanawha River Plant (Appalachian Power)	WVD980554588	Glasgow	YES	YES	
Airco Welding	WVD980554760	Chester	YES	YES	
Appalachian Timber Service	WVD063461958	Sutton	YES	YES	
Bayer Cropscience LP (Rhone Polenc, Aventis)	WVD005005509	Institute	YES	IN	
Bayer Polymers LLC (Miles)	WVD056866312	New Martinsville	YES	YES	
Beazer-Colliers (Koppers-Colliers)	WVD980707178	Colliers	YES	YES	
Crompton Corporation - South Plant (G E Specialty Chemicals 1)	WVD061776977	Morgantown	YES	IN	
Crompton Corporation - North Plant (G E Specialty Chemicals 2)	WVD980552384	Morgantown	YES	IN	
Cytec	WVD004341491	Willow Island	YES	IN	
Dupont - Belle	WVD005012851	Belle	YES	IN	
Dupont Martinsburg - Potomac River Works	WVD041952714	Martinsburg	YES	YES	
Dupont - Washington	WVD045875291	Washington	YES	YES	

Flexsys America L.P. (Solutia Inc., Monsanto)	WVD039990965	Nitro	YES	IN	
FMC - So. Charleston	WVD005005079	South Charleston	YES	YES	
GE Silicones (Crompton, Witco Corp., CK Witco, OSi)	WVD004325353	Friendly	YES	YES	
General Electric Co (GE Plastics, GE Chemicals)	WVD088911854	Washington	YES	YES	

**West Virginia
RCRA Baseline Facilities
EPA Region 3**

Facility fact sheets and the Environmental Indicator forms are Adobe Acrobat PDF files.



For additional facility information, go to the following links:




- Click on the facility name to view the facility fact sheet
- Click on the "YES" to view the facility's completed Environmental Indicator form
- Click on the location name to view a map of the area

	Cleanup Initiated		Complete Without Controls
	Remedy Selected		Complete With Controls



Construction Complete

Facility Name	EPA ID#	Location	Environmental Indicators		Cleanup Status
			HE	GW	
General Motors Corp. (G M C Martinsburg)	WVD044145209	Martinsburg	YES	YES	
Great Lakes Chemicals Corp (FMC)	WVD005005087	Nitro	YES	YES	
KACC Spl. Pile (Kaiser Aluminum & Chemical Co. - Spent Potliner Pile)	WVD988766127	Ravenswood	YES	YES	
Koppers-Follans (Beazer East)	WVD004336749	Follansbee	YES	YES	
Koppers - Green Spring (CSXT)	WVD003080959	Green Spring	YES	YES	
Occidental Chem Corp	WVD005010277	Belle	YES	IN	
P P G Industries	WVD004336343	New Martinsville	YES	YES	
Pechiney Rolled Products Inc. (Century Alum., Ravenswood)	WVD009233297	Ravenswood	YES	YES	
PTO-UCC-Dow (Union Carbide - PTO)	WVD000739722	Nitro	YES	IN	
Quaker State-Congo	WVD057634776	Newell	YES	IN	
SMR Technologies (BF Goodrich)	WVD980555395	Fenwick	YES	YES	
St. Marys Refining (Quaker State)	WVD004337135	St. Marys	YES	YES	
UCC-South Charleston (Union Carbide-So. Charleston)	WVD005005483	South Charleston	IN	IN	
UCC Tech Center (Union Carbide Tech Center)	WVD060682291	South Charleston	YES	IN	

<u>Weirton Steel</u>	WVD000068908	<u>Weirton</u>	IN	IN	
<u>Wheeling - Pittsburgh Steel</u>	WVD004319539	<u>Follansbee</u>	IN	IN	
<u>XSYS Print Solutions, LLC</u> (BASF - Huntington)	WVD000068601	<u>Huntington</u>	<u>YES</u>	<u>YES</u>	

DEFINITIONS

HE - Current Human Exposures Under Control Environmental Indicator (CA725)

GW - Migration of Contaminated Groundwater Under Control Environmental Indicator (CA750)

YES - The Environmental Indicator has been met

IN - More information is needed

Cleanup Started - Initiation of a facility-wide investigation and cleanup.

Cleanup Initiated - Initiation of a facility-wide investigation and cleanup

Remedy Selected - The regulator has selected final cleanup objectives to address contamination and exposures.

Construction Complete - All components of the final remedy are in place and operating as designed.

Complete without Controls - Final cleanup objectives are met for all media, and no further activity or controls are necessary.

Complete with Controls - Final cleanup objectives are met but on-going operation, maintenance and/or monitoring of controls are necessary to ensure protection of human health and the environment.

Groundwater Data Collection and Management

Most groundwater data is collected by facilities or environmental firms on the facilities' behalf. Occasionally samples are collected by DWWWM personnel for the purpose of comparison. Regardless of who is collecting groundwater samples, sampling methodology and analytical testing procedures must comply with the protocols prescribed by the appendices to 40CF261. All samples must be analyzed by laboratories certified by the DWWWM.

Permits do not have a database for the management of groundwater data. Currently, facility groundwater data is submitted in paper form and reviewed by hazardous waste personnel assigned to the facility. In the future groundwater data will be submitted electronically. The electronic data will be stored, managed and shared among the divisions of WVDEP and other agencies with groundwater certification. The electronic data will be available to the public as well. In the future the data will be submitted by e-permitting system.

Program Consideration and Needs

There are difficulties inherent with trying to clean areas to pristine levels where industry has been associated with business activities for decades. There are economic and technical obstacles that need to be considered in areas that will probably never be utilized for drinking water. However, that must be balanced with the ideal that our groundwater is a valuable resource not to be taken for granted. There are many who have a stake in the decisions on how best to manage the environment. In the future, policy and

decision making must be addressed by administration in a manner that each operating unit is clear as to the direction and in the manner these issues are to be decided. The DWWM as a whole needs more GPS units and the necessary training to obtain accurate locational data.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

Division of Water and Waste Management - Water Use Section:

The Water Use Section completed the West Virginia Water Resources Management Plan as required by the 2008 Water Resources Protection and Management Act (W.Va. Code §22-26-1 *et seq*). The plan and its companion reports were adopted by the West Virginia Legislature on June 6th, 2014. This Plan details past flooding and drought in the state, examines water infrastructure needs, describes the need for continued stream gaging and includes projections of future water use.

The Water Use Section has continued to implement the Water Resources Management Plan throughout 2016 and 2017 by making improvements to the Large Quantity Users Survey, reviewing and approving Water Management Plans (WMP's) for horizontal gas wells and several ongoing projects to better define the state's water resources.

Water Use Section - Current Projects:

- ❖ West Virginia Water Resources Management Plan Implementation
- ❖ GIS Internet Based Water Information Tool
- ❖ Water Withdraw Tool
- ❖ Large Quantity Water Users Survey
- ❖ Consumptive Water Use Study
- ❖ Golf Course Water Use Study
- ❖ Water Management Plans for Horizontal Gas Wells
- ❖ Geophysical Well Logging - Ground Water Aquifer Study
- ❖ Mine Pool Study – Location, Quantity, Quality and Sustainability
- ❖ Data management and Geodatabase of ZCC, ZPC and SWPA's
- ❖ Member of the West Virginia Water Gaging Council

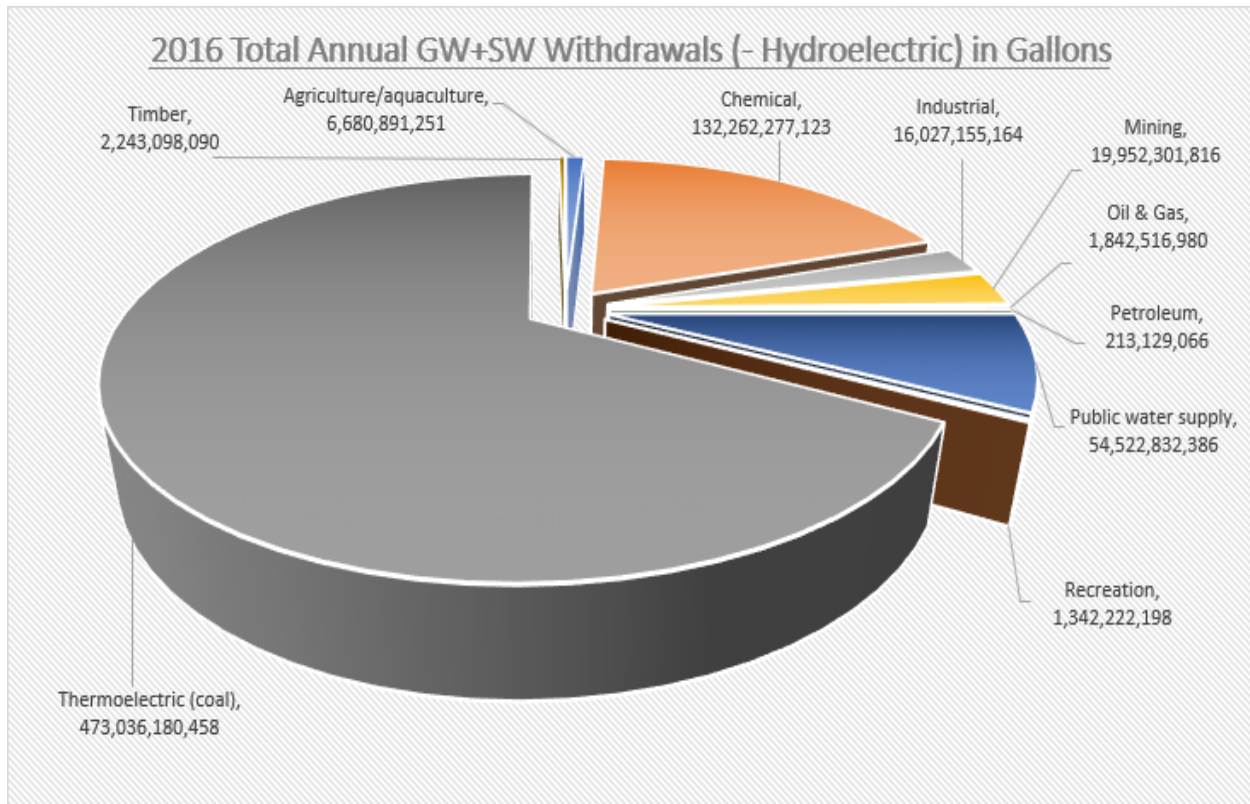
Water Use Section – Water Management Plans for Horizontal Well Drilling:

In 2016, the Water Use Section reviewed and approved 223 Unique Water Management Plans, which included 53 new well pads and 81 modifications, relating to the withdrawal of surface and groundwater used in horizontal well drilling operations. This data is now being collected by the DEP Electronic Submission System allowing the oil and gas industry to report their total water usage on-line. This new system has resulted in the collection and reporting of more consistent and accurate data.

Water Use Section – Large Quantity Users (LQU) Survey:

The West Virginia Water Resources Protection and Management Act identified the need for the protection and conservation of our states water resources. It recognizes that a comprehensive assessment of the availability and use of our states water will benefit the citizens of West Virginia: WV Code §22-26. Therefore, the Water Use Section has

continued to improve the system utilized to complete the Large Quantity Users survey and the Database that houses the information has been revamped to produce more useful reports. The use of the DEP Electronic Submission System allows the LQU's to report their total water usage and other required information on-line. This system has proven to be more efficient, easier to use and has been well received by the LQU community.



Water Use Category	2016 Total SW + GW in Gallons	Coefficient	Estimated Consumptive Use (GAL)
Agriculture/aquaculture	6,751,740,751	0.12	810,208,890
Chemical	141,641,497,559	0.2	28,328,299,512
Industrial	16,784,694,726	0.13	2,182,010,314
Mining	27,578,067,426	0.17	4,688,271,462
Oil & Gas	1,922,271,057	1	1,922,271,057
Petroleum	475,317,162	0.27	128,335,634
Public water supply	66,485,539,602	0.18	11,967,397,128
Recreation	1,385,776,760	0.5	692,888,380
Thermoelectric (coal)	473,483,374,238	0.025	11,837,084,356
Timber	2,252,279,297	0.25	563,069,824
TOTALS	738,760,558,578		63,119,836,558

Water Use Section – Consumptive Use Study:

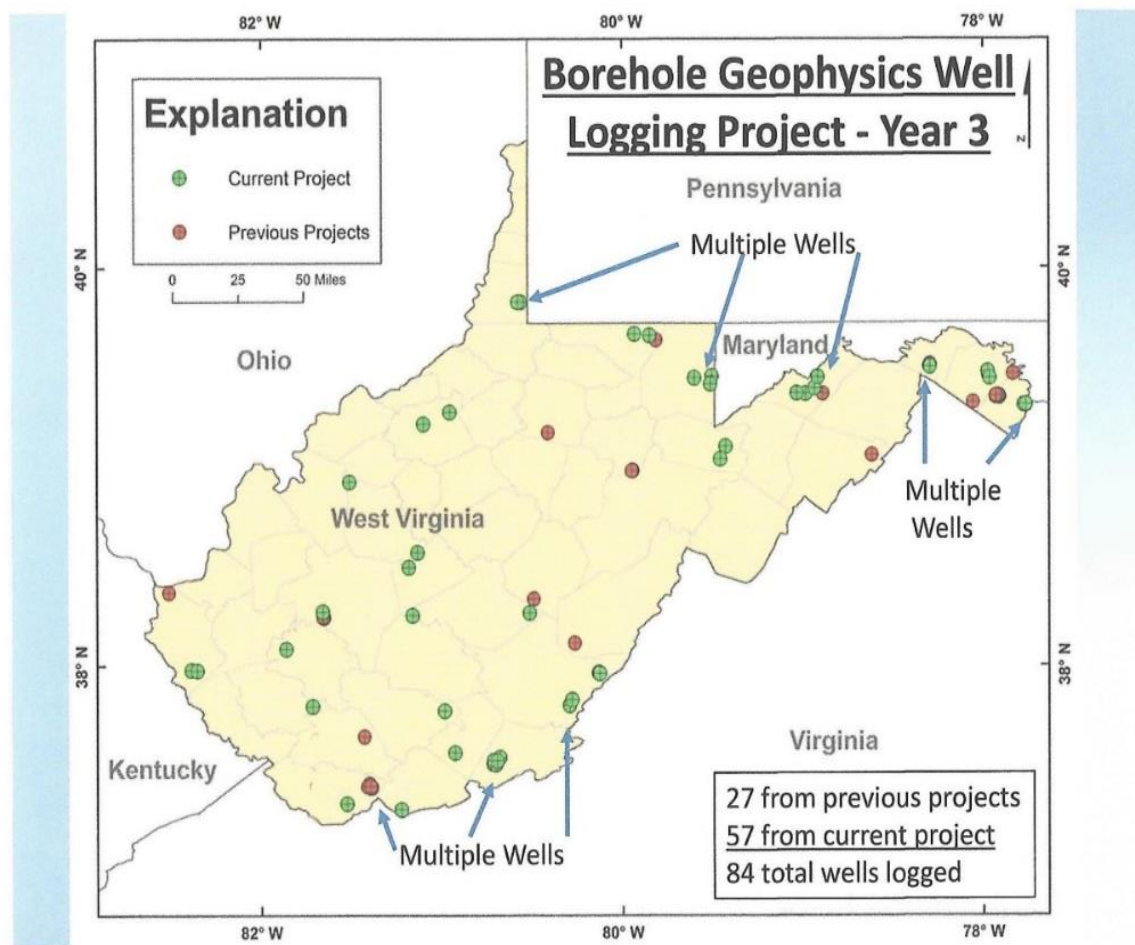
The statewide consumptive use for 2016 has been calculated as 8.5%. Previously the USGS estimates were used where a generalized percentage of consumptive use was applied to the estimated withdrawals by the individual use types reporting a consumptive use of 6%. If you ignore thermoelectric water use, as it does eventually precipitate back to the ground, our consumptive use rate drops to 6.8%. The results below are derived by applying the accepted consumptive use percent to the actual quantity of water

withdrawn by each individual user and then quantified by user category in accordance with the Coefficient Method by SIC Code (USGS, Scientific Investigations Report 2009). <http://pubs.er.usgs.gov/publication/sir20095096> .

Total Gallons Withdrawn in 2016	738,760,558,578
Total Gallons Consumed in 2016	63,119,836,558
Estimated Total Consumptive Use	8.54%

Water Use Section – Geophysical Groundwater Well Logging:

The Water Use Section and the United States Geological Survey have continued a collaborative five-year geophysical well logging project to assess fracture distributions in groundwater wells throughout West Virginia. The third year of this project is ending which has produced 17 newly logged wells for a project total of 57. With the 27 wells we have logged as part of a previous project, we now have 84 wells logged specifically for hydrological data. We intend on logging 43 more wells over the next two years of this project. In 2020, we should have 127 wells logged. The data from this project will be used to characterize the aquifers within the State through a better understanding of the bedding planes, joints, faults, and other fractures through which most of our groundwater flows or is stored. This research will increase knowledge of the depth and location of these water bearing fractures throughout the state. With this information, we should be able to answer the questions about our groundwater aquifers posed by the Act.



V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

2. Groundwater Program

a. Groundwater Quality Standard Variances - Title 47 Series 57

Title 47 Series 57 established procedures for facilities to petition the secretary for a variance from groundwater protection standards for an individual source or for a class of sources. If the secretary agrees that a variance is appropriate, the rulemaking procedures will be initiated in accordance with Chapter 29 Article 3 of the W. Va. Code. The secretary may deny a variance; however, only the legislature may grant a variance.

Variances may be granted by the legislature to allow groundwater quality standards to be exceeded for a single source or class of sources, which by their nature cannot be conducted in compliance with the requirements of W. Va. Code 22-12-5. The benefits of granting the variance must outweigh the benefit of complying with existing groundwater quality standards and demonstrate that there is no technologically feasible alternative available. The request must also show that granting the variance is more in the public interest than adherence to existing groundwater quality standards.

During this reporting period, there have been no new requests for any groundwater quality standard variances. The required reviews are currently being conducted.

b. Groundwater Protection Regulations - Title 47 Series 58 & 47 Series 13

Field inspectors use the Groundwater Protection Plans (GPP) in the field to increase awareness and introduce Best Management Practices (BMTs) at facilities where a UIC permit may or may not be needed. Facilities visited during the reporting period are listed in the table below.

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2015 through June 30, 2017
Braxton County
Elk Valley Salvage
Jard S. Hydraulics
Flatwoods Canoe Run Wastewater Treatment
Boone County
Eastern Mine Supply & Hardware
Mullins Machine Shop
Rogers Wrecker Service
Rogers Used Cars
Jim C Hammer
Hager's Auto
Paul's Auto Repair
Rusty Scissors
Cabell County
Conveyor Manufacture & Supply
Ryders Used Cars
G&A Stone
Route 10 Pit Stop
Fayette County
Ray's Campground
Hico Auto Diesel
Greenbrier County
Summer Wind RV Park
North 219 Service Center
Old White Charities
Harrison County
Pro Contracting
WV Green
1 Lease Rental
Nitro Auto Tire
Jackson County
Statts Mills Campground
Anderson Body Shop
Sonny's Body & Paint
L&L Body Shop
Facemyer Lumber Co
Collison Specialists

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2015 through June 30, 2017
Jackson County
Ron's Car Clinic
Mr. Tractor Sales
Hall's Tires
Adkins Family RV Center
Hinzman's
Jefferson County
Summit Raceway Park
Kanawha County
D.A.R. Collison
Dutch Miller Dodge
Moore's Service Center
R&J Miller Enterprises
Schilling Towing
Service Makers Pre- Owned Autos
DOH
Pennzoil Oil Change
Sherman Williams
L E Meyers
Love/Toyota/Lexus
Hertz Equipment Rental
Nitro Auto Tire
Absolute Tire
Brothers Automotive
Marmet Tire
Orders Construction
Lewis County
Latham
NRE Hagerstown
ENI USA R&M Company
Nexus Drilling
World Wide Equipment of WV
US Well Service
Key Energy Services
WV Pool Construction
Weatherford
C K's Pipeline

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2015 through June 30, 2017
Lincoln County
P&A Auto
Smith Tire Corp
NAPA
Ed Mills Body Shop
Church Auto Repairs
West Hamlin Auto Care
Logan County
One Stop #8535
Mason County
Heritage
WVDNR McClintock Public Hunting
Long Run Transport
Ralph Burns & Sons
Monongalia County
ADC
Panhandle Oil Field Service
Vaughin Energy Services
Digging and Rigging
Snider and Son's
Wenzel
Inspections Oil Field Service
Qualis
Select Services
Tetra Production Testing Services
304 Dips
M&J Auto Repair
A&P Trucking
Putnam County
C. Adam Toney Discount Tires
Terry Thaxton Excavating
Multi Coat Products
34 Last Stop
Enterprise Rental
Buffalo Tire & Brake
Eleanor Tire
Troyer Tire
Greg Chandler Frame/Body
Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2015 through June 30, 2017
Putnam County
Caldwell Truck Repair

McKinney Drilling Company
Shamblin Stone Company
Gill's Automotive
Prebena North America Fastener Co
Backwater Truck Supply
J&T Auto Truck Repair
HYPAR Machine Company
Brian's Tire & Auto Repair
Complete Auto Service
Raleigh County
Mandeville Equipment Company
Leslie Lumber
Leslie Equipment Paint Shop
Roane County
Harper Farm Equipment
Chesapeake Energy
Tucker County
Parsons Timber Watershed Lab
Wayne County
The Great Outdoors
Stephens Motor Sports
Wood County
Circles Campground
River Valley Campground
Equipment Depot
United Construction Company
Denney's Classics
M R Hayes Excavating
Best One Tire Service
Vienna Collison Center
Henderson Wilds
Fontaine Modifications
XPO Logistics
Duke's Pennzoil
State Equipment
Williamstown Auto Service

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2015 through June 30, 2017
Wood County
M&R Excavating
John's Small Engine Repair
Mr. Green Jeans Farm
Hinco Motors MFG
Van's Auto Repair
Wyoming County
Hanover Wrecker Service

Groundwater Protection Plans (GPP) for 737 West Virginia facilities were received by the Groundwater Program during this reporting period. Of these, 337 were approved and sent to the Permits Section. Facilities that do not have permits were mailed letters approving the GPPs or identifying deficiencies and follow up is being done.

During the reporting period, 81 Underground Injection Control permits were issued. 67 were for on-site sewage disposal, 12 for stormwater disposed of underground from man-made conveyances, and 2 were for groundwater remediation. Injection by Rule Authorization for groundwater remediation was approved by the Director: 13 in 2015, 26 in 2016, and 16 in 2017.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

3. Groundwater Program

The Geochemistry of West Virginia's Water

Groundwater quality is affected by human activities and can be degraded as a result of industrial waste disposal, coal mining, oil and gas drilling, agricultural activities, domestic or municipal waste disposal, transportation, and rural development. While the overall quality of West Virginia's water resources are very good, there are many concerns to be addressed, more than the scope of this report will allow here. The Groundwater program is pursuing development of a Needs Assessment to begin a comprehensive database of groundwater quality. Two main concerns expressed by many are pharmaceuticals and endocrine disrupting chemicals in groundwater and Hydraulic fracturing in oil and gas production.

Concerns

Pharmaceuticals and Endocrine Disrupting Chemicals in Groundwater

The presence of pharmaceuticals and endocrine disrupting chemicals in groundwater continues to be major concern as these chemicals are used in so many products consumed in everyday life. Endocrine disrupting chemicals are found in such products as antimicrobial soaps and disinfectants, flame retardants, plasticizers, linings in food containers (such as bisphenol A), food preservatives, shampoos, sunscreen, bug sprays, cosmetics, and many other personal care products. In addition to these products, pharmaceuticals and endocrine disrupting chemicals also enter drinking water supplies as they pass through septic tank and leach field systems, and water treatment plants. The source comes from many over-the-counter medications, veterinary drugs, prescription drugs such as cholesterol medications, natural and synthetic estrogens compounds, heart medications, steroids, and pain medications to name but a few.

The presence of pharmaceuticals and endocrine disrupting chemicals in groundwater has raised concerns regarding their effects on human health including the continued viability of antibiotic medications. Endocrine disruptors can mimic or partly mimic naturally occurring hormones in the body like estrogens (the female sex hormone), androgens (the male sex hormone), and thyroid hormones, potentially producing overstimulation. They also bind to a receptor within a cell and block the endogenous hormone from binding. The normal signal then fails to occur and the body fails to respond properly. Examples of chemicals that block or antagonize hormones are anti-estrogens and anti-androgens. Endocrine disruptors also interfere or block the way natural hormones or their receptors are made or controlled, for example, by altering their metabolism in the liver.

Because endocrine disrupting chemicals are found in such a wide variety of products; their presence appears to be ubiquitous in the environment. Bioassays of fish

in the Potomac River and other bodies of water routinely find intersex characteristics in the fish sampled. One such mutation is the presence of eggs in the testes of male fish. Another concern is the presence of certain antibiotics in ground and surface waters. As many of these compounds are known endocrine disruptors, their presence even at low concentrations warrant additional scrutiny.

The practice of land applying biosolids from waste treatment facilities and livestock operations on agricultural areas must be reevaluated in light of recent research, as these biosolids have been shown to be laden with a wide variety of pharmaceuticals, endocrine disrupting chemicals, and especially, antibiotics. Agricultural industry uses some eighty percent of antibiotics manufactured. At this time, more study needs to be done in this area to determine the appropriate course of action needed to address this concern. Given the amount of pharmaceuticals and endocrine disrupting chemicals entering the environment, recent exemptions for the agricultural industry regarding regulation of land applying biosolids from waste treatment facilities and livestock operations must be perceived as a step in the wrong direction.



Pharmaceuticals and Personal Care Products in the Environment

SUMMARY OF GROUNDWATER QUALITY IN WEST VIRGINIA
United States Geological Survey
West Virginia Department of Environmental Protection Cooperative
Projects FY 2017 and 2018

Introduction

The U. S. Geological Survey (USGS) and the West Virginia Department of Environmental Protection (WVDEP) had four active and one suspended cooperative groundwater projects during West Virginia Fiscal Years 2016 and 2017. These projects were designed to provide the WVDEP with hydrogeologic data and included interpretative projects with respect to groundwater quality and hydrogeologic assessments to support the mission and activities of the WVDEP, and to fulfill requirements of the West Virginia Groundwater Protection Act. Projects include:

1) A statewide groundwater-level network operated by the USGS in cooperation with the WVDEP used for assessment of groundwater storage and drought prediction and monitoring for West Virginia.

2) A statewide borehole-logging project operated cooperatively by the USGS in cooperation with the WVDEP to provide critical insight into groundwater-flow processes within the State's fractured-bedrock aquifers.

3) A statewide project to collect and compile groundwater quality and quantity information for abandoned coal mine aquifers conducted by the USGS and the WVDEP to provide the WVDEP, the Governor's Office, and other state, federal, and local agencies with information related to the location, quality, and quantity of groundwater available from underground mines or mine pools.

4) A project to assess the quality of groundwater used by rural residential homeowners in areas of current and past coal mining and oil and gas development, a project which is part of a long-term on going ambient-groundwater quality program operated by the USGS in cooperation with the WVDEP and the West Virginia Department of Health and Human Resources (WVDHHR).

5) A sentinel network of wells and springs to assess long-term trends in groundwater quality across the state of West Virginia. The sentinel network which is on a 5-year cycle is at present inactive. Finally, a sixth cooperative project to be conducted by the USGS in cooperation with the WVDEP, the WVDHHR, and Monroe County, West Virginia will begin officially on October 1st, 2017 to assess the hydrogeologic framework of complex fractured-bedrock and karst limestone aquifers in Monroe County, West Virginia. The USGS conducted an extensive literature search and began development of an Arc-GIS data base for the project in the Spring of 2017.

Background

The USGS has a long history of cooperative data collection, monitoring efforts, and hydrogeologic studies with the WVDEP and other state, federal, county, and local agencies to provide critical data on surface-water and groundwater quality, stream-flow

discharge, groundwater levels, aquatic health, and to better understand complex groundwater-flow processes. These topics have been investigated thru long-term data-collection networks and interpretative scientific studies and assessments. These data-collection efforts, long-term networks, and hydrologic assessments help to provide information that the WVDEP requires to fulfill its mission. Some of the projects date back to the inception of the West Virginia Department of Environmental Protection. Detailed descriptions of the current projects and monitoring networks follows, with associated maps and tables of sites monitored or assessed as part of on-going projects.

Statewide Groundwater-Level Network

The statewide groundwater-level network is comprised of 17 wells (Table 1) with at least 2 wells in each of West Virginia's six major climatological zones (Fig. 1), and provides state, federal, and local water-resource managers data on the current condition of groundwater levels throughout the State of West Virginia. The data is commonly used to assess current conditions of groundwater storage, to predict the onset of a drought, and in times of drought to assess the severity of the drought with respect to groundwater storage. In many states the data are used by regulatory agencies to issue drought proclamations, and to serve as the basis for issuing voluntary or mandatory water-conservation orders. During the last major drought the data from the network were used to assess the magnitude of the drought with respect to groundwater levels statewide. At that time the statistical analysis of the data had to be computed manually, but at present the data is all automated and easily accessed in a USGS online database titled "Groundwater Watch" (<https://groundwaterwatch.usgs.gov/>).

Table 1. List of wells that comprise the Statewide Groundwater-Level Monitoring Network. The USGS operates the network, which is funded by the USGS and the WVDEP Office of Drinking Water and Waste Management as part of a long-term cooperative project.

USGS Station Number	USGS Well Number	Location of Well
372322081241501	Mcd-0204	McDowell County
373839081255201	Wyo-0148	Wyoming County
380653080155301	Poc-0256	Pocahontas County
381447081393101	Kan-0946	Kanawha County
382008080292801	Web-0167	Webster County
382205082304501	Way-0144	Wayne County
385849079563901	Bar-0136	Barbour County
390333078370801	Hrd-0301	Hardy County
391020080244101	Har-0165	Harrison County
391308081064201	Rit-0116	Ritchie County
391920078032201	Ber-0840	Berkeley County
392200078532001	Min-0173	Mineral County
392725077582401	Ber-0445	Berkeley County
392757077501001	Jef-0797	Jefferson County
393814079484601	Mng-0585	Monongalia County
401216080362703	Brk-0066	Brooke County
401216080362703	Jef-0526	Jefferson County

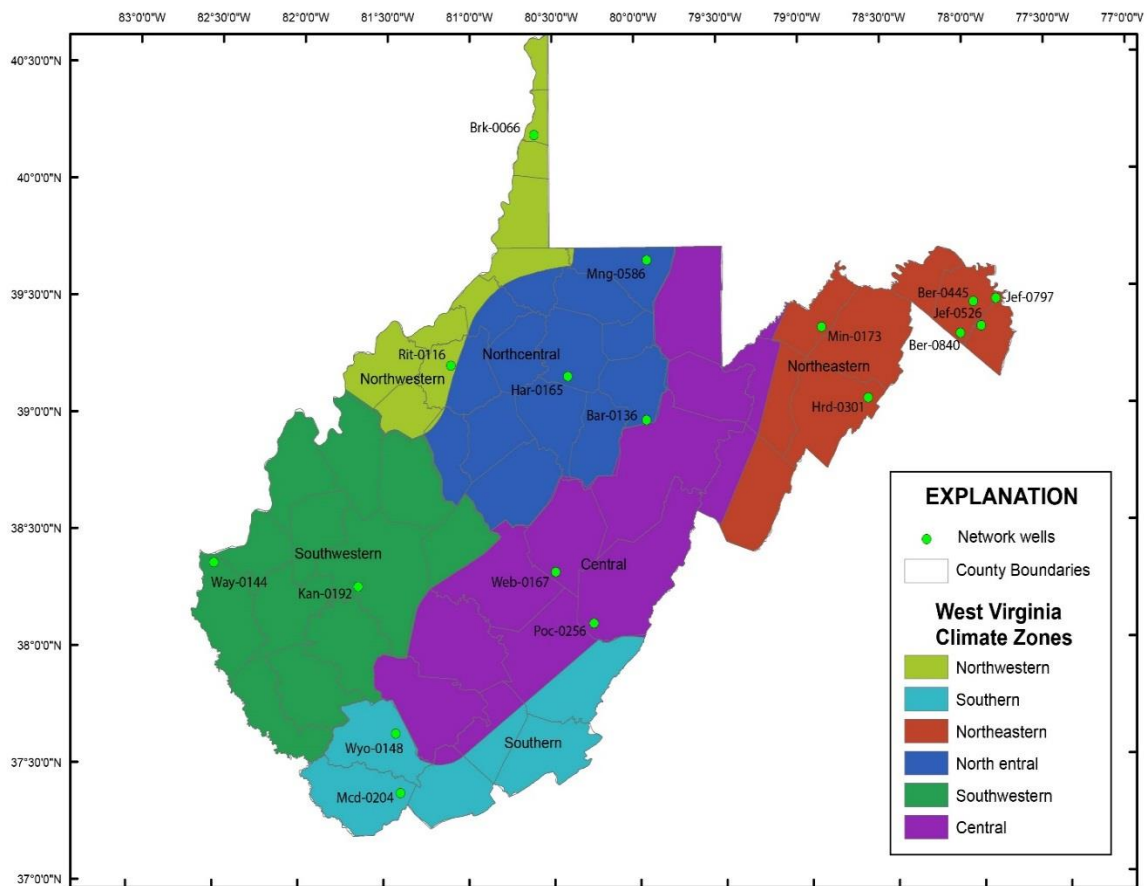


Figure 1. Map showing locations of wells comprising the statewide groundwater-level network and the six major climatological zones within the State of West Virginia.

The following graphs retrieved from the USGS Groundwater Watch website (<https://groundwaterwatch.usgs.gov/NetMapT1L2.asp?ncd=rtn&sc=54>) illustrate how the statistical data for long-term water levels can be used to assess current groundwater levels across the State of West Virginia, and in turn how the data may be used to predict the onset of drought and assess the magnitude of a drought. Figure 2A shows long-term groundwater levels for the past 2 years in context with long-term statistical trends (maximum, minimum, and median daily water levels). Likewise, figure 2B shows daily water levels in context with statistical percentile classes. For example, the orange boxes in figure 2B show the 10th to 24th percentiles of water levels, and the brown boxes show historical groundwater levels less than the 10th percentile, both of which may be used to assess the onset and magnitude of drought conditions.

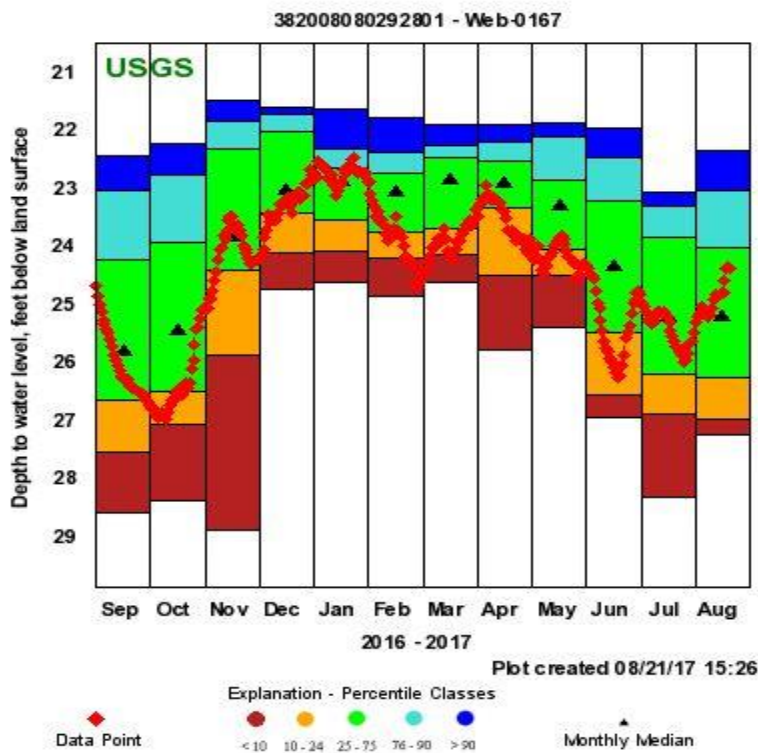
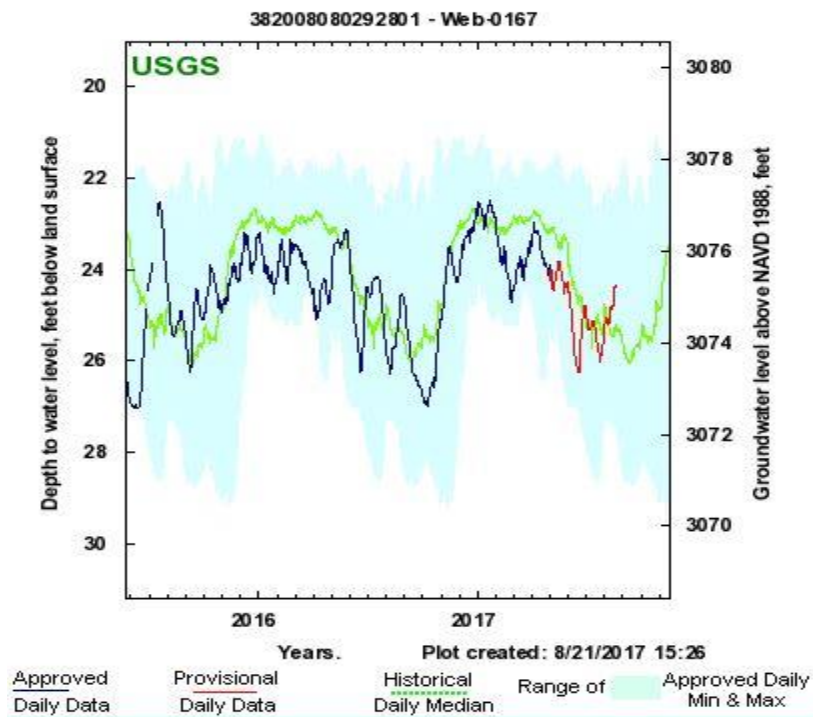


Figure 2. Graphs showing A) daily groundwater levels and B) statistical water level trends for the Webster County monitoring well with respect to long-term data.

Statewide Borehole-Geophysics Project

The West Virginia Department of Environmental Protection (WVDEP) has been mandated by the West Virginia Groundwater Protection Act to characterize groundwater

aquifers within the State. Unfortunately, there are sparse data on which this aquifer characterization may be based. This is especially true for the fractured-bedrock aquifers within the State of West Virginia. The primary method for assessing such fractured-bedrock aquifers is by collecting borehole well-log data from them across the state. A characterization of aquifers within the State requires a better understanding of the bedding planes, joints, faults, and other fractures through which a majority of groundwater flows or is stored. Prior to development of the Statewide Borehole-Geophysics Project borehole well-log data for characterizing fractured-bedrock aquifers were sparse, and limited to a few geographic areas where the USGS had conducted detailed hydrogeologic assessments.

The objective of this project is to develop a well-logging program jointly administered by the USGS and the WVDEP, and to use the data collected as part of the program to better characterize fractured-bedrock aquifers within the State of West Virginia. Prior to development of the joint project, the well-log archive was comprised of the following well logs collected from 11 wells for hydrogeologic investigations recently completed in the Cambro-Ordovician carbonate bedrock-aquifers in the Shenandoah Valley, well logs for 7 wells drilled for a recently completed hydrogeologic investigation of abandoned underground coal mines used as a source of water for public supply in McDowell County, and well logs for 13 wells scattered across the State of West Virginia as part of the joint USGS and WVDEP Statewide Groundwater-Level Monitoring Network. The previous network of 31 wells was insufficient for characterization of the complex and varied fractured-bedrock aquifers across the State of West Virginia.

The goal of the project is to collect well logs from up to 20 wells annually over a 5-year period to augment the existing well logs that were previously available and provide a well-log database sufficient to characterize the fractured-bedrock aquifers across the State of West Virginia with respect to a) topographic setting, b) physiographic province (Appalachian Plateaus, Valley and Ridge, and Blue Ridge), c) lithology (rock type), d) land use, and e) geologic structure (faults, joints, and bedding planes), and other factors. It is anticipated that after 5-years of data collection (currently completing the 3rd year of data collection) a database of approximately 130 well logs will be available for analysis. Upon completion of the data-collection phase of the project, plans are for a cooperative study to assess available logs and to write a report characterizing the nature and extent of fractured-bedrock aquifers within the State of West Virginia. Results of the project will allow water-resource managers to better understand groundwater-flow processes, assess contaminant transport, more accurately simulate groundwater flow, and better manage and develop the groundwater resources of the State's fractured-bedrock aquifers, which comprise more than 95 % of the State's groundwater resources.

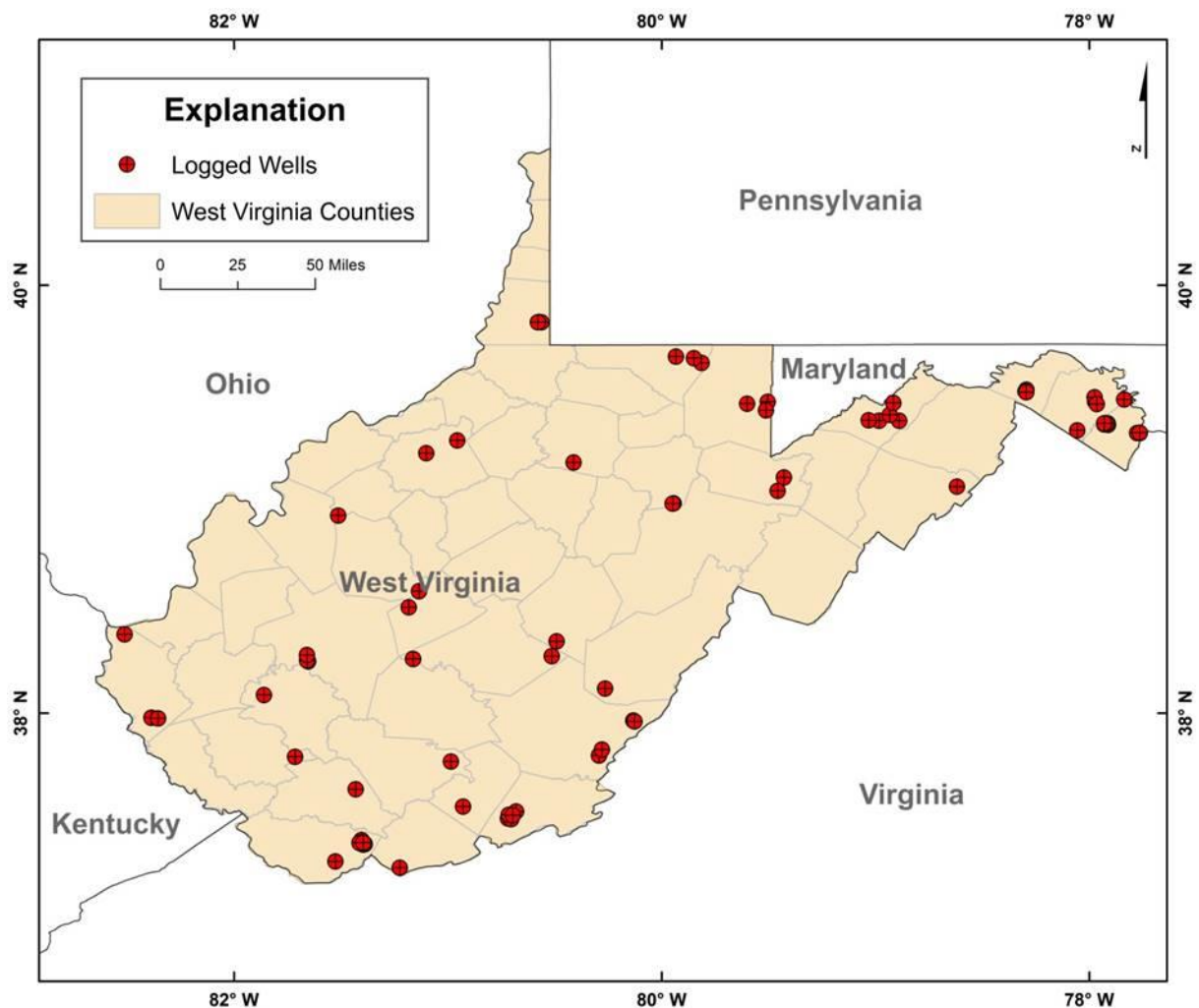


Figure 3. Map showing locations of wells logged as part of the Statewide Borehole-Geophysics Project through August, 2017.

At present 58 new wells have been logged to augment the 31 wells which were previously logged as part of prior USGS hydrogeologic assessments. Figure 3 shows the geographic distribution of the wells logged to date, and Table 2 lists the types of borehole geophysical tools employed for the study and the types of data and assessments which are derived from each specific geophysical tool. The USGS invested approximately \$200,000 in the equipment and vehicle required for the project, and the tools purchased were specifically selected for characterization of the State's fractured-bedrock aquifers.

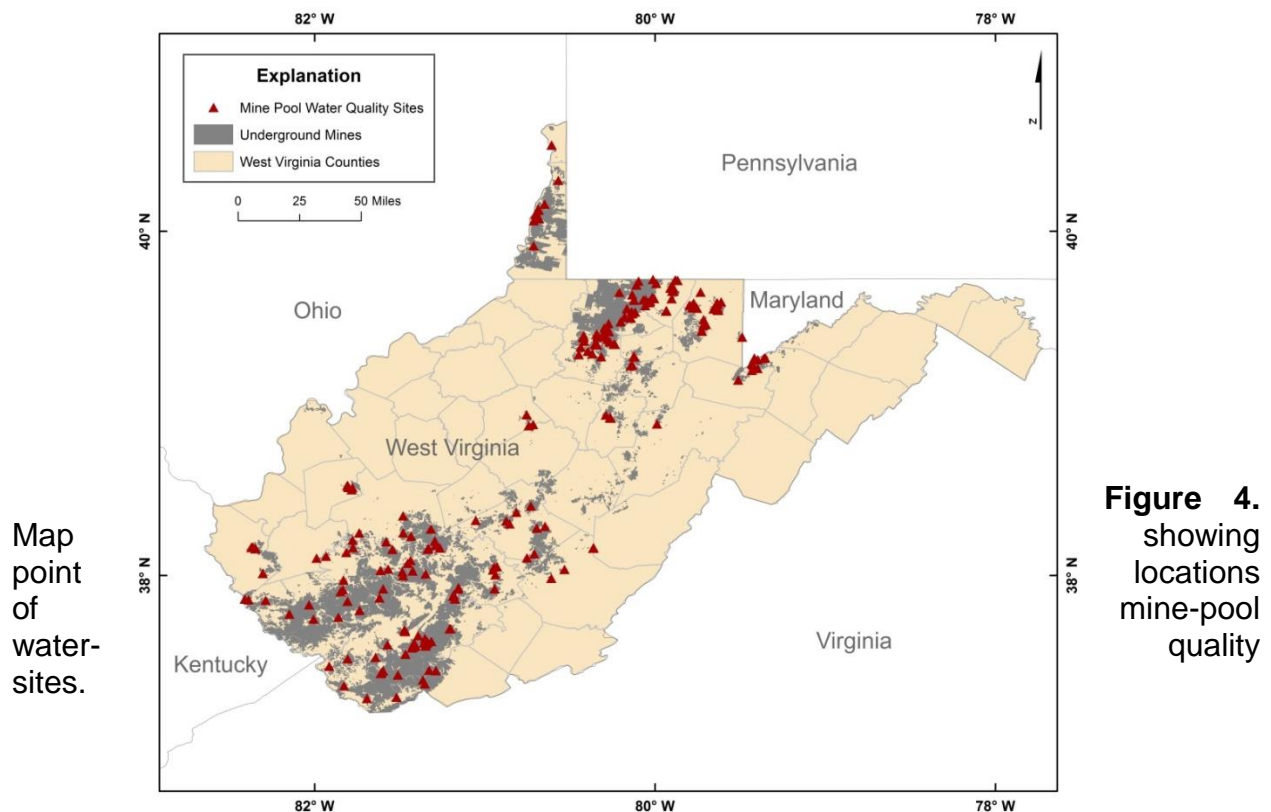
Table 2. Table listing the types of borehole geophysical tools employed for the logging project and the types of data provided by the respective tool.

Borehole Geophysical Tool	Types of data available from the tool
Downhole camera	Provides a 360-degree digital video image of the borehole
3-arm caliper tool	Determines diameter of the borehole, and is commonly used to assess locations of fractures within a well
EM induction tool	Measure formation conductivity and is commonly used to assess borehole lithology and differentiate saline and freshwater zones
Multi-parameter electrical tool	Measures a wide range of formation and fluid properties such as fluid resistivity, formation resistivity, water temperature, natural formation gamma radiation, spontaneous potential and other properties and is commonly used to assess fresh and saline water zones and differentiate formation lithology.
Acoustic televiewer	Uses sound to map the orientation and aperture of fractures within a borehole, and is commonly used to assess fracture distribution in a borehole.
Optical televiewer	Similar to the acoustic televiewer but is based on assessing fractures with a 360 degree digital video camera. Unlike the acoustic televiewer, it can be used in unsaturated portions of the borehole.
EM flowmeter	Measures the flow of water through the tool and is used to assess water bearing fractures within a borehole.
Full wave sonic porosity	Uses sound waves to determine formation and fracture porosity. This is a new tool that assesses formation porosity, a property of aquifers that is not easily determined and has been undocumented in many previous investigations.

Statewide Mine Pool Assessment Project

The objective of this project was to obtain and compile data for underground-mine-pool aquifers for the purpose of using existing mine-pool water-quality data as a reconnaissance tool in development of underground-mine-pools for public supply, industrial, and agricultural use. The data were compiled in an Excel spreadsheet which included spatially extensive data that could be attributed to water resources associated with underground mine-pools throughout West Virginia with 294 sites and 770 samples originating from multiple coal seams (Fig. 4).

The expected benefits from this project include the ability to focus further investigations to 1) determine the suitability of the resource for different uses such as public supply, agricultural use, underground injection, and industrial use, 2) understand the resource for more efficient development of water-resources infrastructure, 3) gain an increased understanding of the spatial distribution of the water resources to aid resource protection, and 4) provide a basis for future characterization needs.



Assessment of Drinking Water Quality in Rural Areas with Active or Legacy Coal Mining or Oil and Gas Development

This project has two primary objectives: 1) to assess groundwater quality in a seven county (Fig. 5) area in West Virginia's southern coal fields province and determine the quality of water available to rural residential homeowners in areas of past or current coal mining, and 2) to assess groundwater quality in an area of current intense Marcellus Shale "wet gas" development (Fig. 6). In addition to examining relations among groundwater quality with respect to coal mining and shale gas production, this study will provide a base line of current conditions for future comparisons. A tertiary but equally important objective is to collect groundwater-quality data in areas of the state that have been under represented in previous studies.

This project is currently on-going, and is scheduled to be completed in FY 2020. At present the water-quality sampling for assessment of the groundwater quality of southern West Virginia's coal mining region has been completed, and a draft of the report will be written early in 2018. Groundwater quality sampling for the Marcellus Shale "wet gas" region is scheduled for the Summer of 2018. A similar report summarizing water quality in the "wet gas" region is scheduled to be written in the Spring of 2019. Analytes to be assessed for each respective study are identified in Table 3.

Table 3. Water-quality characteristics, major ions, metals, trace elements, nutrients, radon-222, and fecal indicator bacteria and method detection limits for samples to be collected for the coal mining region water-quality assessment¹, the Marcellus Shale wet gas region water-quality assessment², or both assessments³. [mg/L, milligrams per liter;

µg/L, micrograms per liter, pCi/L, picocuries per liter; col/100 mL, colonies per 100 milliliters of sample; µS/cm, microsiemens per centimeter, ng/L, nanograms per liter].

Analyte	Method reporting limit	Analyte	Method reporting limit	Analyte	Method reporting limit
Aluminum ³	3 µg/L	Molybendum ³	0.05 µg/L	Uranium-234 ²	0.1 pCi/L
Antimony ³	0.027 µg/L	Nickel ³	0.2 µg/L	Uranium-235 ²	0.1 pCi/L
Arsenic ³	0.1 µg/L	Nitrogen, ammonia ³	0.01 mg/L	Uranium-238 ²	0.1 pCi/L
Barium ³	0.25 µg/L	Nitrogen, nitrite ³	0.001 mg/L	Zinc ³	2µg/L
Beryllium ³	0.02 µg/L	Nitrogen, nitrite + nitrate ³	0.04 mg/L	Alkalinity ³	0.1 mg/L
Bromide ³	0.03 mg/L	Nitrogen, total ³	0.05 mg/L	Bicarbonate ³	0.1 mg/L
Cadmium ³	0.03 µg/L	Phosphorus, phosphate, ortho ³	0.004 mg/L	Carbonate ³	0.1 mg/L
Calcium ³	0.022 mg/L	Potassium ³	0.03 mg/L	Dissolved oxygen ³	0.1 mg/L
Chloride ³	0.02 mg/L	Radon-222 ³	20 pCi/L	pH ³	0.1 units
Chromium ³	.3 µg/L	Radium-224 ²	1 pCi/L	Specific conductance ³	1 µS/cm
Cobalt ³	.050 µg/L	Radium-226 ²	1 pCi/L	Total coliform ¹	1 col/100mL
Copper ³	.8 µg/L	Radium-228 ²	1 pCi/L	<i>E. coli</i> ¹	1 col/100mL
Fluoride ³	0.01 mg/L	Selenium ³	0.05 µg/L		
Gross α radioactivity ¹	3 pCi/L	Silver ³	0.02 µg/L	Methane ²	0.16 ng/L
Gross β radioactivity ¹	4 pCi/L	Sodium ³	0.06 mg/L	Ethane ²	0.30 ng/L
Iron ³	4 µg/L	Strontium ³	0.2 µg/L	Propane ²	0.44 ng/L
Lead ³	0.04 µg/L	Sulfate ³	0.02 mg/L	Butane ²	0.58 ng/L
Analyte	Method reporting limit	Analyte	Method reporting limit	Analyte	Method reporting limit
Magnesium ³	0.011 mg/L	Thallium ³	0.03 µg/L	Pentane ²	0.72 ng/L
Manganese ³	0.2 µg/L	Total Dissolved Solids ³	20 mg/L	Hexane ²	0.86 ng/L
Mercury ²	0.005 µg/L	Uranium ³	0.014 µg/L		

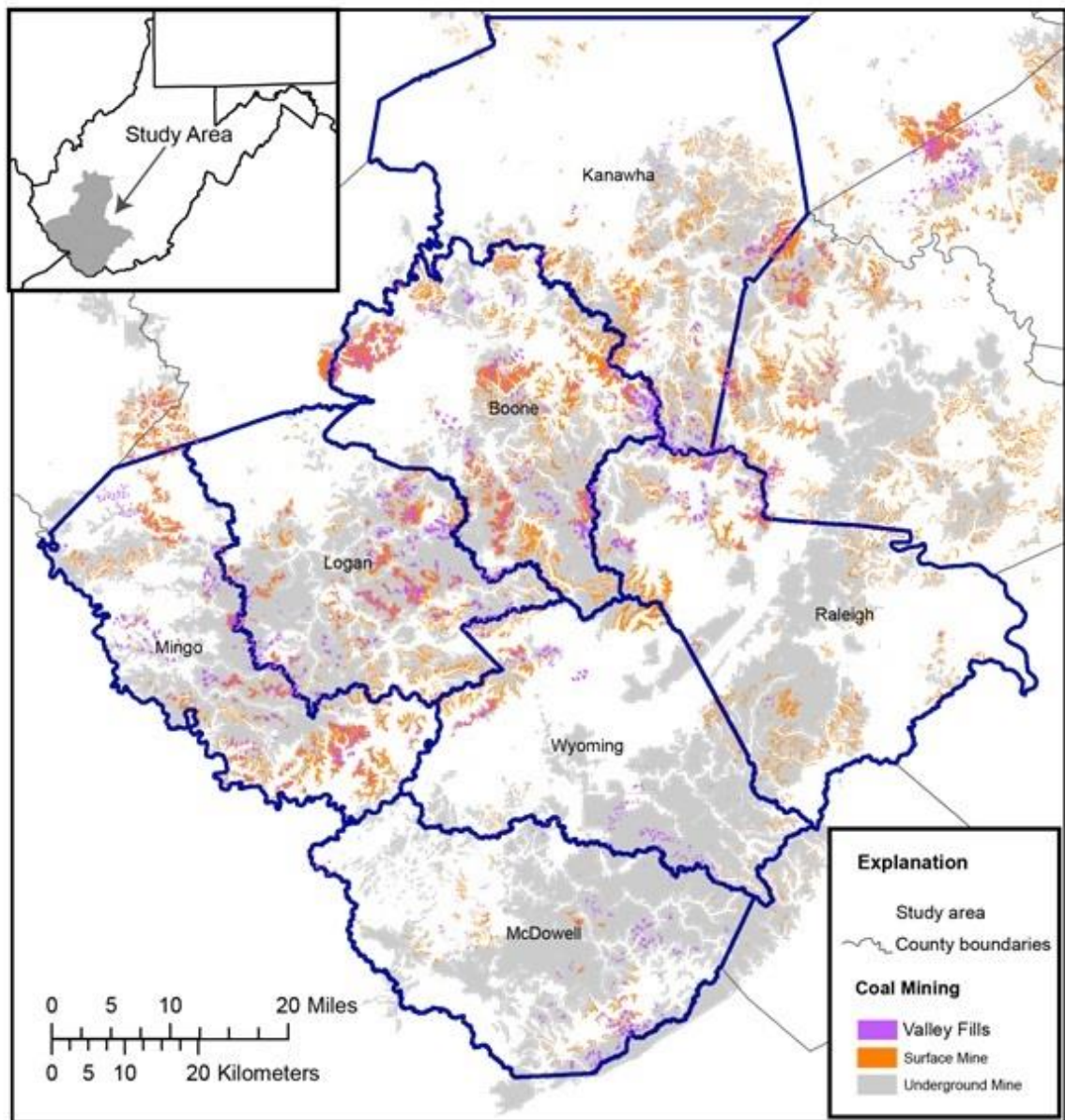


Figure 5. Map showing area of study for the coal mining region water-quality assessment.

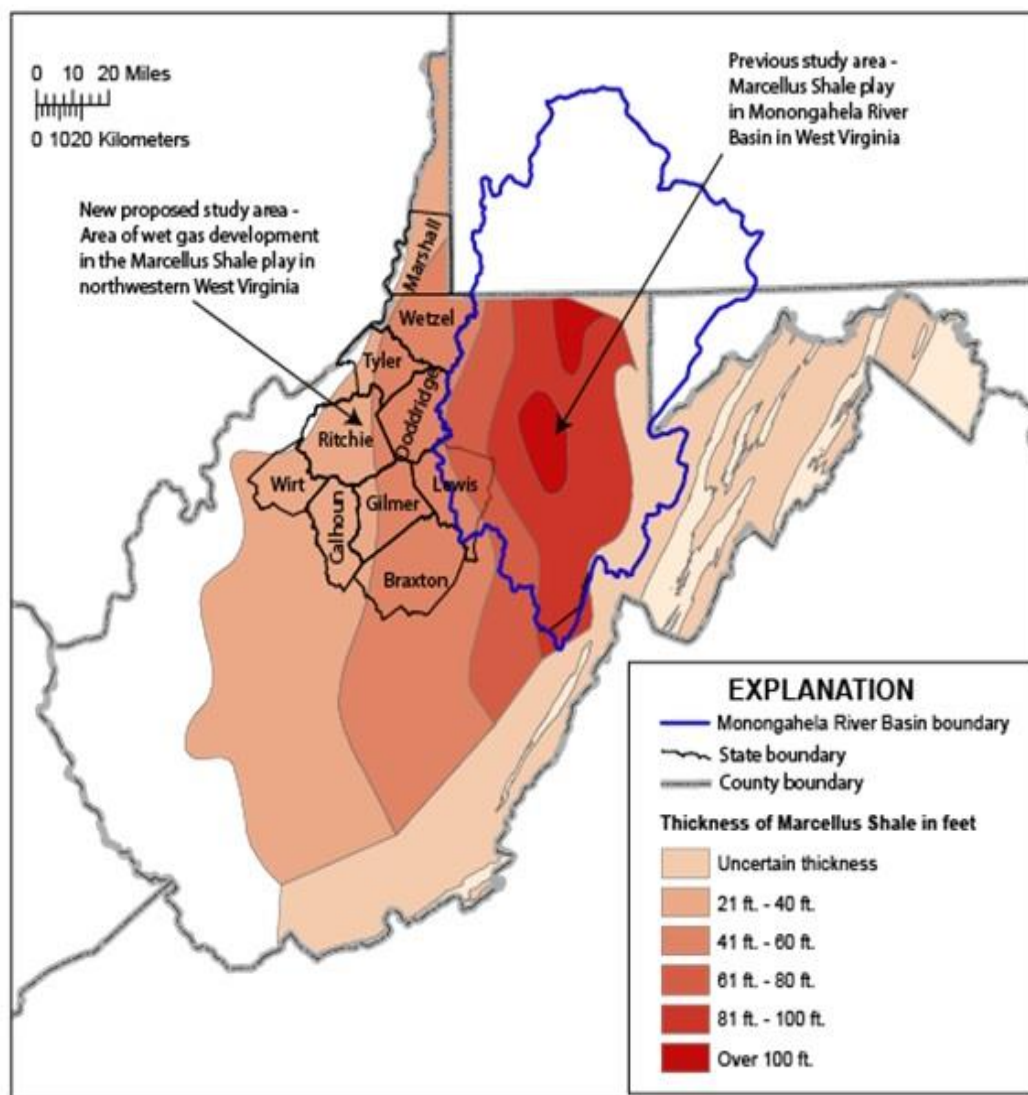


Figure 6. Map showing area of study for the Marcellus Shale “wet gas” region water-quality assessment.

Sentinel Groundwater-Monitoring Network

The 21 wells and 6 springs in the Sentinel Groundwater Network were selected to represent important environmental and hydrogeologic settings in West Virginia and the samples were analyzed for a broad range of constituents (Fig. 7). The project was designed to sample the sites every five years to assess any changes or trends in groundwater quality. Samples from all sites were analyzed for common ions, nutrients, metals, and trace elements (Table 4). For sites in susceptible environmental settings, the samples were further analyzed for industrial compounds, pesticides, or both industrial compounds and pesticides. This sampling was underway at the time of the last biennial report and results were sent to WVDEP in January 2016. This project ended data collection in September, 2015, and the project at present is inactive.

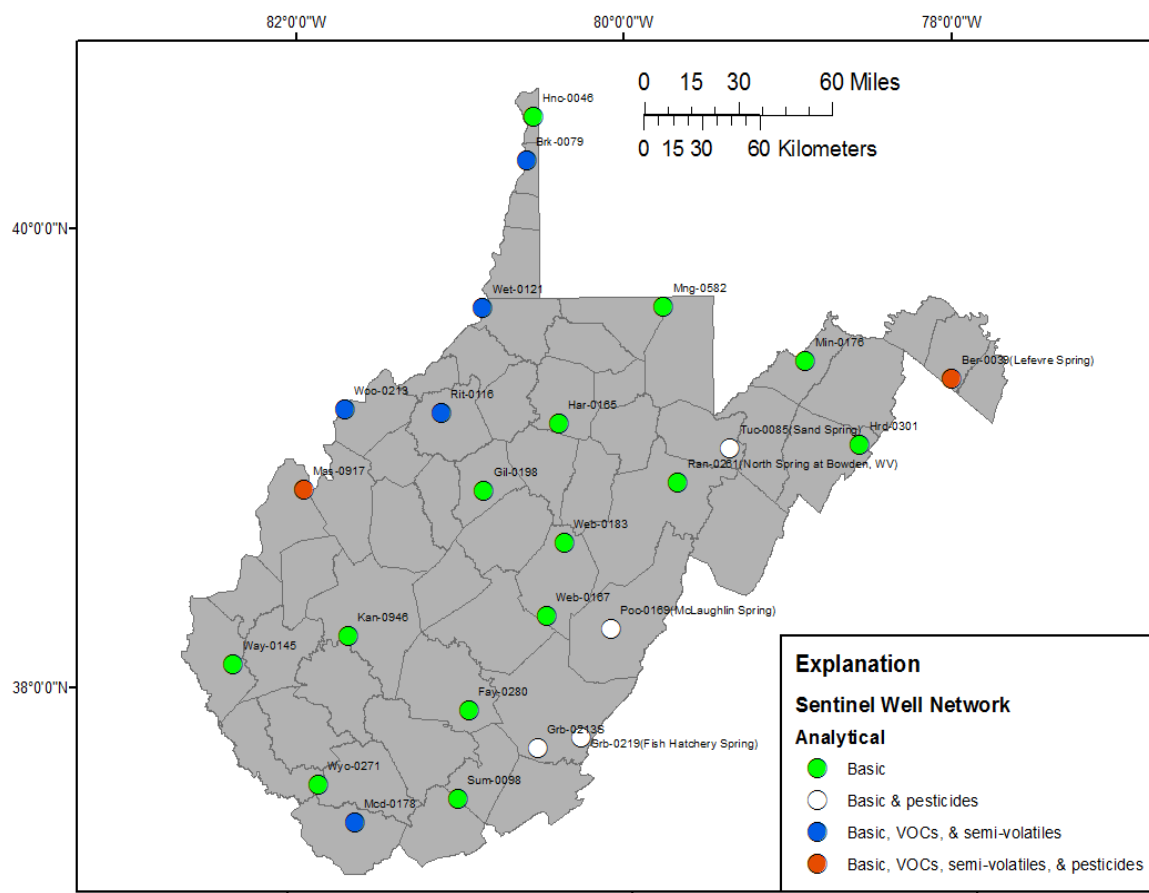


Figure 7. Map showing point locations of wells and springs comprising the Sentinel Groundwater-Monitoring Network.

Table 4. The following major ions, trace elements, nutrients, volatile- and semi-volatile organic compounds (industrial compounds), and pesticides were analyzed for in groundwater samples from the Sentinel Groundwater Network, West Virginia, 2015:

Major Ions		
Aluminum	Iron	Total nitrogen, filtered
Antimony	Lead	Organic carbon
Arsenic	Magnesium	Phosphorus, phosphate, ortho
Barium	Manganese	Potassium
Beryllium	Mercury	Selenium
Cadmium	Nickel	Sodium
Calcium	Nitrogen, ammonia	Sulfate
Chloride	Nitrogen, nitrite	Thallium
Chromium	Nitrogen, nitrite + nitrate	Zinc
Fluoride		

Volatile Organic Compounds		
1,1,1-Trichloroethane	Bromoform	m- and p-Xylene

1,1,2-Trichlorotrifluoroethane	Chlorobenzene	o-Xylene
1,1-Dichloroethane	Chloroform	Styrene
1,1-Dichloroethylene	cis-1,2-Dichloroethylene	tert-Butyl methyl ether
1,2-Dichlorobenzene	Dibromochloromethane	tert-Pentyl methyl ether
1,2-Dichloroethane	Dichlorodifluoromethane	Tetrachloroethylene
1,2-Dichloropropane	Dichloromethane	Tetrachloromethane
1,3-Dichlorobenzene	Diethyl ether	Tetrachloromethane
1,4-Dichlorobenzene	Diisopropyl ether	trans-1,2-Dichloroethylene
Benzene	Ethyl tert-butyl ether	trans-1,2-Dichloroethylene
Bromodichloromethane	Ethylbenzene	Trichloroethylene
Semi-Volatile Organic Compounds		
1,2,4-Trichlorobenzene	Diethyl phthalate	2,4,6-Trichlorophenol
1,2-Dichlorobenzene	Dimethyl phthalate	2,4-Dichlorophenol
1,2-Diphenylhydrazine	Fluoranthene	2,4-Dimethylphenol
1,3-Dichlorobenzene	Fluorene	2,4-Dinitrophenol
1,4-Dichlorobenzene	Hexachlorobenzene	2,4-Dinitrotoluene
3,3'-Dichlorobenzidine	Hexachlorobutadiene	2,6-Dinitrotoluene
4,6-Dinitro-2-methylphenol	Hexachlorocyclopentadiene	2-Chloronaphthalene
2-Nitrophenol	Hexachloroethane	2-Chlorophenol
4-Bromophenylphenylether	Indeno[1,2,3-cd]pyrene	4-Chloro-3-methylphenol
Di-n-butyl phthalate	Isophorone	4-Chlorophenyl phenyl ether
Di-n-octyl phthalate	N-Nitrosodi-n-propylamine	4-Nitrophenol
Dibenz[a,h]anthracene	N-Nitrosodimethylamine	Acenaphthene
Anthracene	Benzo[b]fluoranthene	4-Nitrophenol
Benz[a]anthracene	Benz[a]anthracene	Acenaphthene
Benzo[a]pyrene	Benzo[a]pyrene	Naphthalene
Benzo[b]fluoranthene	bis(2-chloroisopropyl) ether	Nitrobenzene
Benzo[ghi]perylene	Bis(2-ethylhexyl) phthalate	Pentachlorophenol
Benzo[k]fluoranthene	Butylbenzyl phthalate	Phenanthrene
bis(2-Chloroethoxy)methane	Chrysene	Phenol
bis(2-Chloroethyl)ether		Pyrene

Pesticides		
2,6-Diethylaniline	Fipronil	p,p'-DDE
Acetochlor	Desulfinylfipronil amide	Parathion
Alachlor	Diazinon	Pebulate
alpha-HCH	Dieldrin	Pendimethalin
Atrazine	Disulfoton	Phorate
Benfluralin	Fipronil sulfide	Prometon
Butylate	Fipronil sulfone	Propachlor
Carbaryl	Fonofos	Propanil
Carbofuran	Lindane	Propargite

Chlorpyrifos	Linuron	Propyzamide
cis-Permethrin	Malathion	Simazine
Cyanazine	Methyl parathion	Tebuthiuron
CIAT	Metolachlor	Terbacil
EPTC	Metribuzin	Terbufos
Ethalfuralin	Molinate	Thiobencarb
Ethoprophos	Napropamide	Tri-allate
		Trifluralin

[°C, degrees Celsius; $\mu\text{S}/\text{cm}$, microsiemens per centimeter; FNU, formazin nephelometric units; Basic, Water-quality properties, major ions, trace elements, and nutrients; VOC, volatile organic compound; Semi-vol, semi-volatile organic compound]

5. Non-Point Source Program

Non-Point Source Program (NPS) Overview

In 2016 West Virginia's NPS Program provided technical and financial support to 101 programs and projects ranging from general administration to outreach, planning, monitoring and implementation. Most of the projects focus on priority areas identified within our watershed based plans (WBPs), but other partners and stakeholders implement projects in non-priority areas using their required matching funds, or by taking advantage of [additional grant opportunities](#) (AGOs).

Executive Summary

Best management practices (BMPs) implementation and nonpoint source (NPS) pollutant reduction is the major goal of our watershed projects. The efforts of our dedicated staff, partners and local stakeholders have made significant impacts in restoring and protecting our watersheds impacted and threatened by NPS pollution. In 2016 BMP implementation was completed in *38 different HUC12 watersheds*, 53 percent of the implementation occurred in priority watersheds. The remaining are a result of WV Conservation Agency (WVCA) statewide [agriculture enhancement programs](#). Table 1 shows the total BMP implementation. These reductions are a result of 21 projects in 15 priority watersheds and an additional 18 projects from WVCA's agriculture enhancement programs in 23 other watersheds. Figure 1 provides a map of the HUC12 watersheds where pollution reductions occurred in 2016.

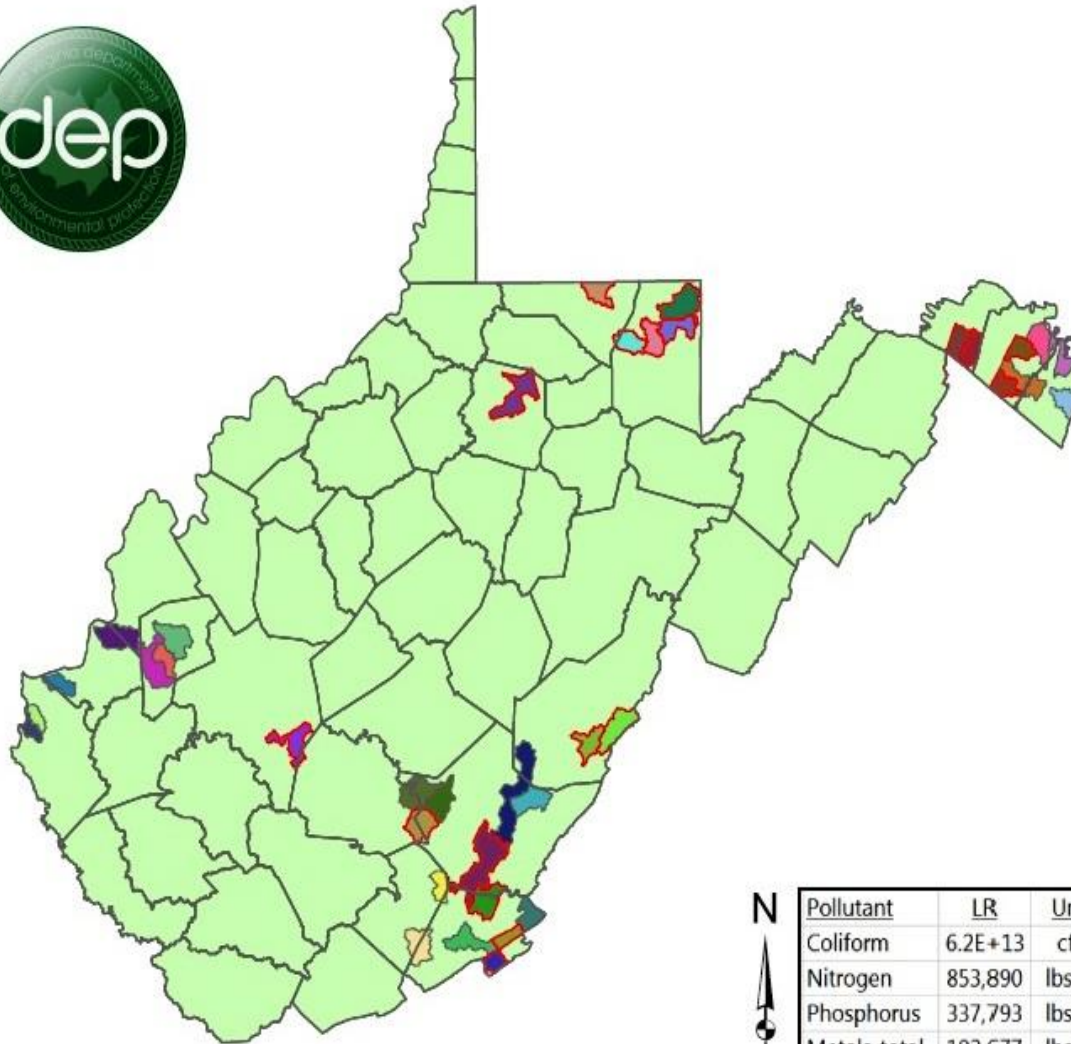
Table 1: 2016 BMP Implementation

BMP	Totals	Unit
AMD ponds-wetlands	276,032	Sqft
Limestone leachbed	62,893	Sqft
Fencing	40,364	Ft
Heavy use protection	11,694	Sqft
Stream restoration	7,506	Ft
Nutrient management	6,270	Ac
Limestone channel	2,876	Ft
Grazing systems	2,542	Sqft
Water systems	1,920	Ft/IU
Watering pond	600	Sqft
Septics	89	IU
AMD systems	7	IU
Erosion control	4	Sqft

Acid mine drainage (AMD) ponds include settling and collection ponds, and constructed wetlands. Fencing includes division and streamside fencing. The stream restoration category includes natural stream channel design and streambank protection BMPs. The septic category includes all repair, replacement and pumping. AMD systems are the total number of treatment systems installed plus important components. Watering systems include individual units and feet of pipeline. Erosion control projects are associated with construction projects of less than one acre and other agriculture situations where erosion control is necessary, such as heavy use protection areas.

In West Virginia bacteria and pollutants associated with AMD are the two largest contributors of nonpoint sources accounting for approximately 70 percent of the impairments. Most of the bacteria loads

come from agriculture and failing septic, whereas the AMD pollutants (i.e. acidity, metals etc.) are associated with abandoned mining. In addition to the West Virginia priorities, US Environmental Protection Agency's (EPA) National §319 Program promotes the reduction of nutrients and sediment, which are the leading causes of nonpoint source impairments nationwide. Although nutrients and sediment are not our focus, with the help of partner agencies we have already exceeded our Management Plan goals. Note: West Virginia's [*NPS management plan*](#) was approved in early 2015, one of the first in Region III. Nutrient and sediment reductions are important for restoration of the Chesapeake Bay watershed, and West Virginia continues to meet of the goals and objectives of the most recent [*Watershed Implementation Plan*](#).



Pollutant	LR	Unit
Coliform	6.2E+13	cfu
Nitrogen	853,890	lbs/yr
Phosphorus	337,793	lbs/yr
Metals-total	102,677	lbs/yr
Sediment	11,287	tons/yr
Acidity	161	tons/yr

Legend

Load Reductions

Priority Watersheds

watersheds_12digit_Clip3

HU_12_NAME

Bear Creek-Big Sandy River

Beaver Creek-Little Sandy Creek

Buffalo Creek-Kanawha River

Flowing Springs Run-Shenandoah River

Fourpole Creek

Greens Run-Cheat River

Griffith Creek-Greenbrier River

Guyan Creek

Headwaters Deckers Creek

Headwaters Knapp Creek

Hoke Run-Opequon Creek

Hughes Creek-Kanawha River

Hurricane Creek

Limestone Run-West Fork River

Lower Indian Creek

Lower Second Creek

Meadow Creek-Meadow River

Middle Creek-Opequon Creek

Middle Fork Sleepy Creek

Mill Creek

Mill Creek-Meadow River

Milligan Creek-Greenbrier River

Muddy Creek

Outlet Knapp Creek

Outlet Spring Creek

Poplar Fork

Rattlesnake Run-Potomac River

Sewell Creek

Slabcamp Run-Greenbrier River

South Fork Potts Creek-North Fork Potts Creek

Sweet Springs Creek-Cove Creek

Tuscarora Creek

Upper Indian Creek

Upper Second Creek

Upper Sleepy Creek

West Run-Monongahela River

Whites Creek

Watershed project highlights

In 2016, 12 watershed projects were completed. This section highlights three representative projects, which includes AMD remediation, bacteria reductions and source

water protection. Project summaries are available through EPA's Grant Records Tracking System (GRTS) [public access portal](#) and the most recent [NPS annual report](#).

Sleepy Creek phase II

The goal of this project was to reduce fecal coliform counts in the watershed and meet the TMDL through the establishment of riparian buffers, urban tree plantings (reforestation) and stormwater management practices. Additionally, this project funded water quality monitoring to detect sources of fecal coliform impairment and public education events that included agricultural field days and stormwater management training. In addition to BMP implementation, several educational events were held including agricultural field days and a stormwater management training. [Cacapon Institute](#) conducted water quality monitoring and measured levels of fecal coliform bacteria.



A wide variety of partners were involved in the implementation of this project, including WVCA, *Eastern Panhandle Conservation District* (EPCD), CI, *WV Division of Forestry* (WVDOF), USDA, *Natural Resource Conservation Service* (NRCS), Region 9 *Planning and Development Council*, [Sleepy Creek Watershed Association](#) (SCWA) volunteers, landowners, local schools and others. The riparian buffer project shown provides an example of the effort. It consisted of 393 trees and several days of hard work from 36 volunteers as well as local, state and federal agency representatives. Other efforts in the watershed brought together diverse groups, but this riparian buffer planting provides the best example of the dedication to protecting and restoring the Sleepy Creek watershed. The project was completed on-time and within budget using \$70,200 in §319 funds, and \$43,000 in state and local match.



Ingrand mine remediation

The purpose of this project was to treat water draining from the abandoned Ingrand Mine before it enters an unnamed tributary to Kanes Creek. [Friends of Deckers Creek](#) (FODC) received fiscal year 2013 funds to design and install a passive treatment system to capture and clean the AMD emanating from the Ingrand Mine. The completion of this project marks the sixth AMD remediation site

installed by FODC within the Kanes Creek subwatershed. The purpose of this project was to treat water draining from the abandoned Ingrand Mine before it enters an unnamed tributary to Kanes Creek. FODC received fiscal year 2013 funds to design and install a passive treatment system to capture and clean the AMD emanating from the Ingrand Mine. The completion of this

Low pH Iron oxidation terrace

project marks the sixth AMD remediation site installed by FODC within the Kanawha Creek subwatershed.

Thus, far project performance is outstanding, significantly reducing the AMD pollutants entering the unnamed tributary to Kanawha Creek. The first round of water quality data shows a 99.6% reduction, which is 21.8% better than the project's goals. Acidity reduction is 40,540 lbs/year and the total metals are being reduced by 7,210 lbs/year. FODC expects even better results once the wetland treatment systems mature. This project was supported by WVDEP's §319 Program, \$284,585 and the [Office of Surface Mining](#) Watershed Cooperative Agreement, \$107,000. FODC contributed \$68,415 as an in-kind match and further raised an additional \$7,000 to purchase the land for the project.

Protecting source water

EPA funds helped West Virginia residents and utilities engage in source water protection efforts in the wake of the Elk River chemical spill of 2014. The spill contaminated the water supply of more than 300,000 people in the capitol city of Charleston and surrounding counties (nearly 1/6th of the state's population).

AT A GLANCE

- Below: Counties impacted by the Elk River spill.
 - Safe Water for WV project engaged citizens across the state after the spill.
-

WVDEP used \$15,000 from its EPA [§319 grant](#) to support a community education and engagement project to actively involve citizens in plans to protect their drinking water sources. The \$15,000 was the largest contribution to the \$50,000 project.

The "Safe Water for WV" project led by the [West Virginia Rivers Coalition](#) (WVRC) included a series of public forums, social media, educational tools, local partner network building and technical assistance to provide citizens with information on source water planning and their role in the process. A key activity was the development of a [Citizen's Guide to Drinking Water Protection](#). The overall goal of the project was to help protect drinking water supplies throughout the state by ensuring that watershed groups and other community stakeholders assumed a constructive role in the source water planning process.



A law passed by the state after the spill ([SB-373](#)) required public water systems across the state to draft or update source water protection plans with the public's involvement. The plans are designed to help manage pollution from general sources that could endanger drinking water supplies. Per WVRC, the Elk River chemical leak and ensuing water crisis was an awakening for many to the sources and vulnerability of their water supplies. It was the first time many people thought about where their drinking water comes from and the connection between watershed protection, public health and

economic security. Among the results of the Safe Water for WV project were five public forums attended by at least 345 community members, 72 local partners and 10 public water utilities. The Citizen's Guide was distributed at the forum and was discussed in a statewide webinar. WVDEP will use funds from its 2017 §319 grant award for a pilot project, which integrates Source Water Protection Plans and Watershed Based Plans in two watersheds.

Groundwater

West Virginia's NPS Program's projects do not focus specifically on our groundwater resources; however, many projects such as septic repair/replacements, certain stormwater BMPs, source water and acid mine drainage projects may have an indirect influence. Table 2 provides a list of nonpoint projects that have most or part of those components.

Table 2. §319 projects with possible groundwater influences

FY12 §319 Funds	Organization	NPS	Grant	Spent	Type	Status
Piney Creek pet waste stations	PCWA	1469	\$3,000	\$3,000	stormwater	complete
GRWA fish hatchery wetland	WVCA	1491	\$20,000	\$20,000	stormwater	complete
Fayette Square stormwater	PAN	1414	\$131,420	\$120,051	stormwater	complete
Roaring Creek Mars Portal AMD	WVU	1415	\$43,967	\$43,967	mining	complete
West Run AMD remediation WVU	WVU	1379	\$145,214	\$145,214	mining	complete
Swamp Run - Left Fork Buckhannon	WVU	1564	\$219,000	\$219,000	mining	complete
FY13 §319 Funds	Organization	NPS	Grant	Spent	Type	Status
Sleepy Creek Phase 2	SCWA	1453	\$70,200	\$70,200	septic	complete
Upper Muddy Creek Phase 2.1	FOC	1456	\$222,709	\$222,709	mining	complete
Ingrand Mine & VH #3	FODC	1471	\$284,585	\$284,412	mining	complete
Summerlee Phase 1.2	PAN	1457	\$29,733	\$29,733	mining	complete

FY14 §319 Funds	Organization	NPS	Grant	Spent	Type	Status
Latta's stormwater	Latta's	1516	\$34,600	\$34,600	stormwater	complete
Source water planning - Fayette County	FCC	1551	\$10,000	\$4,000	source water	active
Sovern England AMD	FOC	1500	\$252,368	\$27,642	mining	active
Greens Run railroad refuse	FOC	1527	\$105,000	\$98,485	mining	active
Kanes Creek South upgrade	FODC	1502	\$112,750	\$18,140	mining	active
Revitalization of Valley Point 12	FODC	1503	\$163,100	\$55,430	mining	active
Sleepy Creek - Phase 3	SCWA	1504	\$74,600	\$19,063	septic	active
Sewell Creek septic - WVCA	WVCA	1570	\$53,100	\$13,584	septic	active
FY15 §319 Funds	Organization	NPS	Grant	Spent	Type	Status
WVRC source water planning	WVRC	1548	\$15,000	\$15,000	source water	complete

Piney Creek WSA pet waste	PCWA	1600	\$4,000	\$1,854	stormwater	active
WVCA Back Creek porous pavers	WVCA/DNR	1601	\$20,000	-	stormwater	active
Tuscarora Creek Phase 2	CVI	1540	\$56,523	\$21,388	septic	active
Mill Creek Opequon Phase 2	CVI	1541	\$161,801	\$18,363	septic	active
Morris Creek upper mainstem	MCWA	1529	\$49,265	\$48,664	mining	active
Pase active treatment	FOC	1530	\$101,387	\$10,488	mining	active
Valley highwall upgrade	FODC	1532	\$170,500	\$6,708	mining	active
Summerlee - Phase 2	PAN	1534	\$163,412	\$163,412	mining	active
Elks Run Watershed Phase 2	WVCA	1536	\$68,200	\$1,685	septic	active
Herods Run, Buckhannon	WVU/BRWA	1533	\$226,145	\$68,522	mining	active
FY16 \$319 Funds	Organization	NPS	Grant	Spent	Type	Status
Goodnews Mountaineer Garage rain gardens	GMG	1599	\$3,000	\$2,066	stormwater	active
WVRC source water community engagement	WVRC	1604	\$17,000	-	source water	active
Browns Creek - Coal River	CRG	1583	\$126,000	\$1,009	septic	active
Beaver Creek AMD	FOC	1584	\$175,100	\$4,758	mining	active
Sandy Run Renovation	FODC	1585	\$223,500	\$1,431	mining	active
Beckley Little League	PCWA	1586	\$54,291	-	stormwater	active
Swamp Run #2	WVU/BRWA	1589	\$183,954	\$5,050	mining	active

To learn more go to: <http://bit.ly/2wflZcu> and download the most recent NPS and past annual reports or contact the NPS Program Coordinator.

6. Watershed Assessment Branch

The Watershed Assessment Branch (WAB) was created in March 2002 from the joining of two existing programs, the Watershed Assessment Section (WAS) and the Total Maximum Daily Load (TMDL) Section. The WAB consists of biologists, environmental specialists, and analysts whose primary focus is to measure and assess the physical, chemical, and biological integrity of WV's streams, rivers, and lakes. Although this water quality information is used for a myriad of purposes, a major effort is placed on the preparation of The West Virginia Integrated Water Quality Monitoring and Assessment Report (IR) http://www.dep.wv.gov/WWE/watershed/IR/Pages/303d_305b.aspx. This report, required by U.S. EPA every 2 years, combines the 303(d) list of impaired waterbodies with the 305(b) assessment, a report that focuses on the overall quality of West Virginia's waters.

The WAB utilizes a specific combination of physical, chemical, and biological variables to help assess the health of streams and lakes in WV. These measures also help identify potential stressors and how they may be affecting the aquatic life communities of these waterbodies.

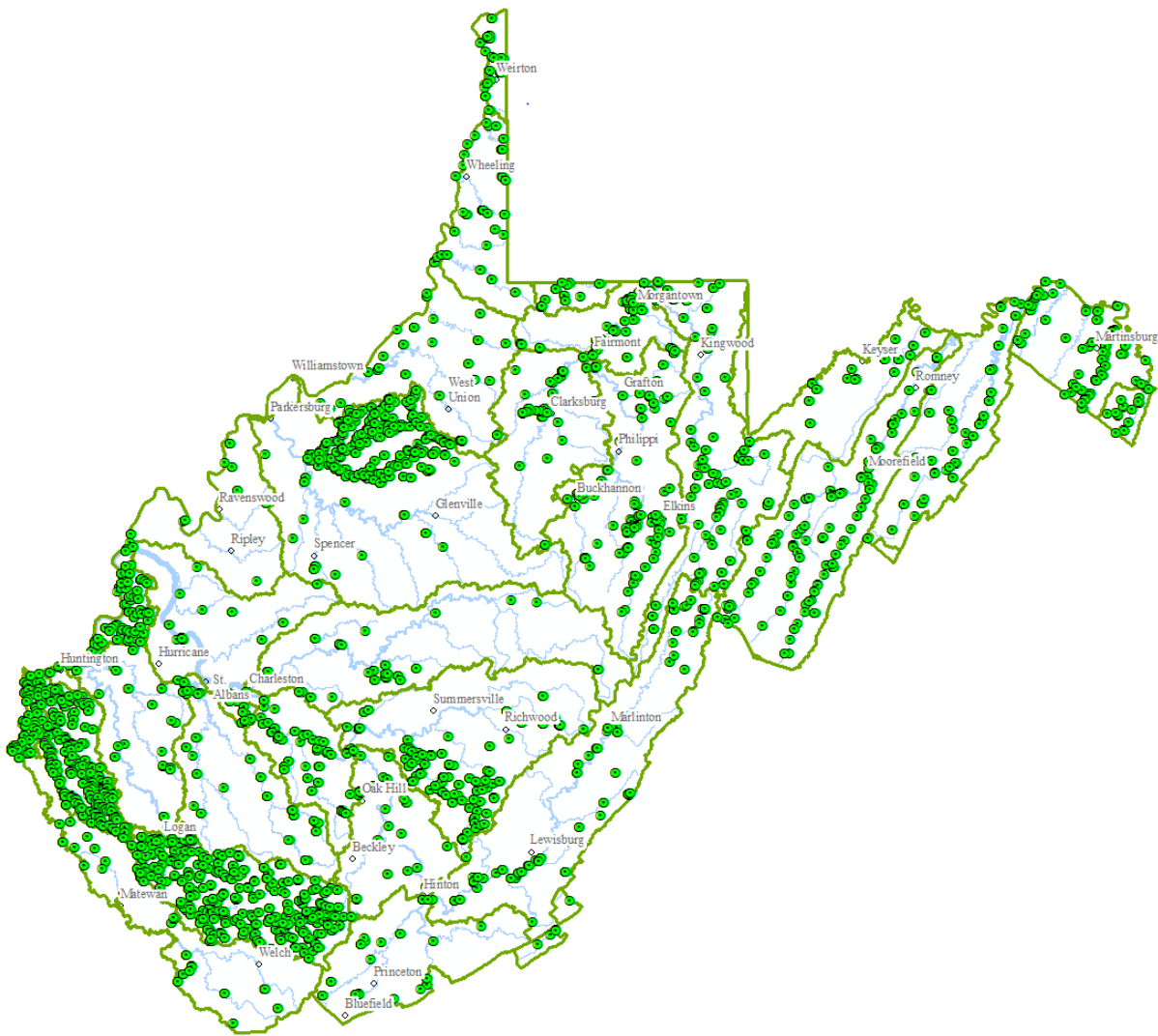
The WAB uses a variety of programs to assess and monitor WV's waterbodies. These include a stratified probabilistic monitoring design or "random" sampling design; a targeted sampling design; a long-term or "ambient" site network (mainly in WV's largest streams and rivers); a continuous monitoring design using deployable water quality meters (dataloggers); and a thorough pre-TMDL development monitoring effort – all designed to meet the objective of assessing the water quality of waterbodies throughout

WV. In 2007, WAB added the 'LiTMuS' monitoring program, which entails annual sampling of wadeable streams throughout the state to better understand annual variation and track changes in different stream types with different stressors.

In 2012, the LiTMuS program was expanded to include research to monitor water quality, biology, and flow changes over time at several minimally impacted streams in WV. This research is a collaborative effort with the United States Environmental Protection Agency (US EPA) Global Change Assessment group, along with other states and US EPA offices from various regions, to develop Regional Monitoring Networks (RMNs) that can detect small, progressive changes in stream aquatic life communities that may be associated with climate change. Two major components of this study are the collection of temperature and stream discharge data, each being significantly related to groundwater. It is predicted that groundwater will help buffer streams from increases in air temperatures, at least in the near future. Furthermore, it is believed that streams with more groundwater contribution during base flow will be less sensitive to temperature increases. The WAB has established five RMN monitoring stations on five different WV streams, all with exceptional water quality, that are being monitored for temperature, discharge, and aquatic life status as part of this collaborative study.

In general, assessments are performed on a watershed basis. To better manage the state's water resources, West Virginia has been divided into 32 watersheds, or hydrologic regions. Each watershed is assessed every five years, according to the state's Watershed Management Framework. The targeted and pre-TMDL sampling programs are based on this five-year rotating basin schedule, whereas the Ambient, Probabilistic and LiTMuS programs collect data statewide annually.

From January 1, 2014 through December 30, 2016, WAB personnel conducted assessments that resulted in the collection of 13,078 water quality samples from 2,090 sites on 1,316 distinct streams, rivers, and lakes. These sites are shown below.



The WAB measures a variety of physicochemical parameters in waterbodies that are evaluated in the field or determined via laboratory analysis. The more common lab parameters analyzed include alkalinity, acidity, hardness, aluminum, iron, manganese, basic ions and nutrients.

Habitat evaluations are important to waterbody assessments because they reflect the physical conditions that support aquatic life communities. WAB utilizes U.S. EPA's Rapid Bioassessment Protocol (RBP) for measuring the quality of in-channel and riparian habitat in streams and rivers. Channel flow status is evaluated as part of the RBP protocol. During drought conditions, groundwater discharges are important for maintaining a healthy channel flow status, and therefore the water levels necessary to support aquatic life.

The physical and chemical properties of water, as well as habitat quality are important in the overall assessment of waterbody health. However, the biological monitoring of aquatic life communities such as benthic macroinvertebrates and fishes, provides WAB a more comprehensive evaluation of ecological integrity. This is especially

true for benthic macroinvertebrates (animals without backbones that live on the bottom of streams such as insects, crayfish, snails, worms) because they are diverse in species, live in all stream sizes, have a wide range of tolerances to pollutants and stressors, and unlike grab samples of water that represent an instant in time, reflect past water quality conditions. For example, water quality measures like dissolved oxygen are important, but, only provide information about the specific current environmental conditions. A sudden spill or periodic discharge of toxic substances, which flowed past an assessment site a week ago, for example, would likely be revealed in an impaired benthic macroinvertebrate community, but likely would not be detected in the analysis of a water sample.

The WAB tries to identify pollutants and their sources, both regulated and non-regulated, and the severity of impacts on streams in watersheds throughout the state. For instance, fecal coliform bacteria from open pipe discharges, failing septic systems, failing sewer lines, inappropriate animal waste management techniques, and "collect and dump" sewage treatment activities are major stressor on the groundwater and surface waters in West Virginia. By identifying streams with violations of the criteria for fecal coliform bacteria, WAB has identified sub-watersheds with groundwater that is likely impaired by fecal coliform bacteria. Since fecal coliform bacteria is usually filtered out by groundwater seeping through dirt, sand and rock, additional studies must be conducted to confirm the potential impairment of groundwater. However, in karst areas, where groundwater is not subjected to as much filtering, the presence of fecal coliform bacteria in streams is a clear indicator that groundwater pollution has occurred "upstream".

By identifying streams impacted by acid mine drainage, WAB has identified areas where the groundwater also is likely impaired. By helping identify these areas, WAB has made it possible to target remediation efforts lessening the negative effects on fish and benthic communities.

The WAB has developed and maintains the 303(d) list of impaired waters. These impaired waters have, in some cases, been linked to contaminated groundwater. This, perhaps, is the single greatest contribution to groundwater protection by WAB.

TMDLs (Total Maximum Daily Load) are required by the federal CWA. In simple terms, a TMDL is a plan of action used to clean up streams that are not meeting water quality standards. The plan includes pollution source identification and strategy development for contaminant source reduction or elimination. Originally, TMDLs were developed under the 1997 settlement of the lawsuit, *Ohio Valley Environmental Coalition, Inc., West Virginia Highlands Conservancy, et. al. v. Browner, et. al.*, which sought state and federal aid to improve and maintain West Virginia's water quality. The lawsuit resulted in a consent decree between the plaintiffs and the EPA. The consent decree established a rigorous schedule for TMDL development, requiring the federal agency to develop over 500 TMDLs from West Virginia's 303(d) list of impaired streams by March 2006 (extended to September 30, 2009).

After settlement of the lawsuit in 1997 and the resulting consent decree, the EPA began developing TMDLs for West Virginia streams, with the DEP providing onsite logistical and technical support. However, beginning with the Upper Kanawha River watershed in 2001, WVDEP assumed the lead in developing TMDLs for state waters. In 2009, WVDEP completed TMDL development for all remaining streams listed in the 1997 consent decree.

In future years it is possible that additional cases of stream contamination documented on the 303(d) list will be traced back through groundwater to their original sources. WAB will then be able to suggest remediation and restoration activities to improve groundwater and surface water quality in West Virginia.

Although not a significant portion of its assessment and monitoring activities, the WAB does coordinate and participate with wetland monitoring activities in WV. Such monitoring activities include; 1) National Wetland Condition Assessment (USEPA), 2) Wetland Delineations, 3) support of the WVWRAP – West Virginia Wetland Rapid Assessment Protocol (WV DNR), & 4) communication with wetland alteration permitting agencies (WV DEP/WV DNR/US ACOE).

Currently, all assessment and monitoring data is stored and managed in a database called WABbase. WABbase is a custom, in-house designed database that utilizes Oracle as a back-end with multiple Microsoft Access front-ends. Currently, a portion of the data is entered manually. However, most certified laboratories have been submitting lab analyzed water quality results electronically. Additionally, WAB is in the process of resuming submitting surface water quality information to EPA's STORET database via their Water Quality Portal.

WAB uses ArcGIS (ArcMap) to strategically plan the location of sampling sites, to identify the geologic and land use patterns upstream from the sampling sites, and to establish a list of potential waterbody stressors associated with both surface and underground activities and disturbances. WAB also uses this program to print maps showing the geographic distribution of violations in a watershed.

7. State Water Pollution Control Revolving Fund (SRF)

The SRF program environmental goals are to reduce and/or eliminate water quality violations caused by sanitary wastewater and nonpoint sources in surface waters and groundwater. In FY2016 and FY2017 approximately \$125 million dollars of assistance was expended from the SRF program to build and replace wastewater collection and treatment systems. In many of these projects, unsewered areas of West Virginia were provided with centralized or, in some cases, decentralized sewer systems that eliminated direct wastewater discharges and failing or marginally functional onsite septic systems. The failing systems and direct discharges contribute to polluting the groundwater in the state. For example, the Greater St. Albans Public Service District is installing ten miles of gravity sewer pipe, eight miles of force main, and other appurtenances that will eliminate three existing privately owned wastewater treatment systems and serve approximately 680 new customers.

Design standards for the SRF program are included in the Legislative Rules, Title 47 Series 31 and include restrictions on constructing sewer lines within 10 horizontal feet of a drinking water reservoir, 50 feet of any well or spring utilized for a public drinking water system, 50 feet of a private or individual homeowner's drinking water system, or within 10 feet of a homeowner's well. The enforcement of these regulations helps protect public and private water supplies.

The DEP's Agriculture Water Quality Loan Program is also administered through the SRF program. This program was established in 1997 and continues to provide loans to correct nonpoint source pollution. The program is set up as a cooperative effort between the WVDEP, WV Soil Conservation Agency (SCA), USDA Natural Resources Conservation Service (NRCS), local Soil Conservation Districts (SCD) and local banking institutions. No new loans were made under this program during FY2016 and FY2017. This program is dependent on grant funds provided to the NRCS with a match provided by the CWSRF. The SRF will provide \$150,000 as a set-aside for this program for FY2018.

A pilot program was started in 2000 called the Onsite Systems Loan Program. The purpose of this nonpoint source program is to eliminate existing health hazards and water quality problems due to direct sewage discharges from houses and malfunctioning septic tank systems. Many problems and barriers have prevented this program from being successful to date, but program revisions have been made to make it a more viable program. During the 2007 legislative session, the SRF statute was amended to allow other entities to act as an intermediary lender for this program. The WV Housing Development Fund and the SAFE Housing and Economic Development, Inc. (SHED) have entered into an agreement with the SRF to provide low interest loans to homeowners to correct failing onsite sewage systems. The program provided 33 loans totaling \$219,146 in FY 2016 and 38 loans totaling \$280,404 in FY2017 from this program and will provide \$300,000 as a set-aside for this program for FY2018.

8. Environmental Enforcement

The Environmental Enforcement (EE) office is primarily responsible for inspection and enforcement of the state and federal solid waste, hazardous waste, underground and aboveground storage tank and water pollution control laws. EE's groundwater objective is to investigate all reports of contamination that fall within its jurisdiction and to refer all reports of contamination which are not under its jurisdiction to the appropriate authority.

The Compliance Monitoring Unit of the Environmental Enforcement Section of DEP has been assigned the responsibility to conduct Groundwater Sampling Inspections (GSI's) at various facilities throughout the State. Primarily, these facilities are active and inactive municipal and industrial landfill sites. The sites selected for sampling comes from requests from DEP's permitting staff, regional inspectors/supervisors and the discretion of the Compliance Monitoring unit.

The Department of Environmental Protection's Quality Assurance/Quality Control Plan and Standard Operating Procedures for Groundwater Sampling Revision No. 1 (effective August 5, 2009) is used by the Monitoring Unit as a guide when conducting GSI's.

Generally, all landfill sites will have a minimum of four (4) groundwater monitor wells. The number of wells per site will depend on the size of the landfill and could be as high as twenty (20) or more. Data collected from these wells depend upon whether it is

an industrial or a municipal landfill. All municipal landfills generally have the same parameters (Phase I) as outlined in 33CSR Appendix I.

Collection of groundwater samples is accomplished by compressed air operated bladder pumps as well as bailers. All organics are collected by teflon bailers. All samples are collected, preserved and analyzed in accordance with 40 CFR. Groundwater samples are analyzed by State certified laboratories.

The Pre-Closure Program continues the review of industrial facilities that are in the process of ceasing operations. The review process allows EE to ensure that all known contamination is remediated. All groundwater wells present at the sites are sampled during this process. When any contaminated soil is identified at the facility, remediation is required under the Groundwater Protection Act.

Training that focuses on the complex interaction of groundwater, geology, and chemistry must be provided to EE staff. This training must include all staff, but prioritize newly hired inspectors. Classroom style training accompanied with ample practical (hands on) training exercises with a focus on sample collection and preservation would be most beneficial. This training program will result in environmental inspectors that are both effective and safety conscious in their field work.

EE recognizes the need for a centralized database system that is accessible to all inspectors and other agency staff. EE maintains hard copy files on groundwater complaints, investigations, Notice of Violations (NOV's), enforcement actions, spills, Well Head Protection Areas, reports on groundwater flow mapping, groundwater quality data, and monitoring well data for landfills and industrial sites. Due to storage limitations, this information cannot be maintained in accessible files for extended periods of time. Currently, the only utilization of the ERIS data base is for permit information.

The Hazardous Waste Management Act, Underground Storage Tank (UST) act and Aboveground Storage Tank Act are, in part, groundwater protection acts. The Hazardous Waste Management Act requires long term groundwater monitoring at permitted disposal sites. EE Inspectors conduct Operation and Maintenance inspections every three years at every hazardous waste land disposal facility in the state. These inspections involve evaluating the facility's groundwater monitoring methods and sampling protocols. Inspectors may split samples with the permit holder to conduct an independent analysis of the groundwater that has been sampled.

The UST Act requires release detection, corrosion protection, overfill protection and spill prevention at UST sites to ensure protection of the groundwater. The Energy Policy Act of 2005 has increased the regulations applicable to USTs installed within 1,000 feet of existing community water systems or potable drinking water wells. The Energy Policy Act requires states to perform on-site inspections at all UST facilities every three (3) years. In addition, the Energy Policy Act included additional requirements related to secondary containment, delivery prohibition and operator training at UST sites. These additional requirements have been incorporated into the Federal UST rule which became effective on October 13, 2015 and which West Virginia must adopt by October 13, 2018 in order to maintain primacy over the UST program.

The AST Act was crafted in response to the Freedom Industries Spill. Originally promulgated in 2014, the statute has been refined to focus on higher risk ASTs. The applicable legislative rule was finalized in 2016. Like the UST act, this act requires tank registration, release detection, corrosion protection, overfill protection and spill prevention at AST sites. Protection of groundwater as well as surface water through comprehensive tank regulation is the focus of this new statute and rule. The act focuses on tanks that present the highest threat to water sources by virtue of their size, contents or location.

Additionally, in fiscal years 2016 and 2017, EE personnel investigated 1,459 spills and 1,894 complaints that had the potential to impact our groundwater.

V. DEPARTMENT of ENVIRONMENTAL PROTECTION

C. Office of Abandoned Mine Lands and Reclamation

In reviewing surface mining legislation in the mid-1970s, Congress found that more than 1.5 million acres of land had been directly disturbed by coal mining and more than 11,500 miles of streams were polluted by sedimentation or acidity from surface or underground mines. In response to the problems associated with inadequate reclamation of coal mining sites, Congress enacted the Surface Mining Control and Reclamation Act of 1977 (SMCRA).

The two main purposes of SMCRA are (1) to establish a nationwide program to protect society and the environment from the adverse effects of surface mining operations while assuring that the coal supply essential to the nation's energy requirement is provided and (2) to promote the reclamation of mined areas left without adequate reclamation before SMCRA was passed. Title V of SMCRA deals with active mining, Title IV deals specifically with the problems associated with inadequate reclamation of abandoned mine lands (AML).

In Title IV, Congress established the Abandoned Mine Reclamation Fund to be used for the reclamation and restoration of areas affected by past mining. The fund is derived from a reclamation fee collected from coal mining operators on each ton of coal mined since SMCRA was enacted.

West Virginia received primacy of the AML program February 21, 1981, and the WVDEP was designated by the governor to operate this program with funding provided from the AML Reclamation Fund. The Office of Abandoned Mine Lands and Reclamation (AML&R) was established within the WVDEP.

The mission statement of the Office of AML&R is "to protect public health, safety, and property from past coal mining and enhance the environment through reclamation and restoration of land and water resources".

The program's vision statement is to, "efficiently and effectively use all available resources to achieve a long term benefit to public health, safety, property and general welfare while restoring the environment to pre-mining conditions".

AML&R Organizational Structure

AML&R is divided into groups: Administration & Financial, Realty, Planning, Design and In - House Design, Construction and Emergency. The state is served by northern and southern regional offices. The responsibilities of those groups are:

1. **Administration & Financial** - This group performs the accounting function for the office. The group tracks expenditures as they relate to administrative and construction functions responsible for management of grants, budgets and financial administration of AML&R. Furthermore, the group oversees the Stream Restoration section that is mandated to perform all program, pre-construction, post-construction and compliance, and water monitoring functions.

2. **Realty** - This group gains rights of entry from property owners so that exploration and construction can be conducted to address abandoned mine land problems. Also, the group's responsibility includes determining if before and after appraisals are necessary for the purposes of lien actions.

3. **Planning** - The Planning group identifies abandoned mine land problems. Each requires preparation of environmental assessments to be in compliance with the National Environmental Policy Act (NEPA), creation of a description of each project, and development of a preferred alternative for correcting the problem. The group also maintains the West Virginia Abandoned Mine Land Inventory.

4. **Design & In - House Design** - This group approves all consultant plans and specifications involving abandoned mine land projects. It also evaluates and selects a design consultant to perform all necessary preparation of plans and specifications for projects. This group also administers exploratory drilling, aerial mapping, surveying contracts, and prepares plan and specification on selected projects in-house.

5. **Construction** - The main task of the Construction group is contract administration and oversight of abandoned mine land construction projects. This includes site inspections during construction. The group conducts pre-bid and pre-construction conferences and performs final inspections.

6. **Emergency** - This group administers and conducts the Emergency Reclamation program.

AML Public Health and Safety Issues

SMCRA defined eligible sites under Title IV as those sites which were mined for coal and left in an inadequate state of reclamation prior to August 4, 1977, and for which there is no continuing reclamation responsibility under state or federal law. The definition of eligibility was extended in 1992 to sites mined for coal after August 4, 1977. These sites were abandoned before the date the secretary of the U.S. Department of the Interior approved a regulatory program for the state in which the sites are located.

The expenditures of monies from the fund on lands and water eligible shall reflect the following priorities stated in Section 403 (a) in the Surface Mining Control and Reclamation Act Amendments of 2006:

1. (A) The protection of public health, safety, and property from extreme dangers of adverse effects of coal mining practices;

(B) the restoration of land and water resources and the environment that –
 - (i) have been degraded by the adverse effects of coal mining practices; and
 - (ii) are adjacent to a site that has been or will be remediated under subparagraph (A)
2. (A) The protection of public health and safety from adverse effects of coal mining practices;

(B) The restoration of land and water resources and the environment that -
 - (i) have been degraded by the adverse effects of coal mining practices; and
 - (ii) are adjacent to a site that has been or will be remediated under subparagraph (A); and
3. The restoration of land and water resources and the environment previously degraded by adverse effects of coal mining practices including measures for the conservation and development of soil, water (excluding channelization), woodland, fish and wildlife, recreation resources, and agricultural productivity.

The SMCRA Amendments of 2006 stated that any state or tribe may extend funds allocated to such state and tribe in any year through the grants for the purpose of protecting, repairing, replacing, constructing, or enhancing facilities related to water supply, including water distribution facilities and treatment plants, to replace water supplies adversely affected by coal mining practices.

The U.S. Office of Surface Mining (OSM) maintains an inventory of abandoned mine problems known as the Abandoned Mine Lands Inventory System (AMLIS). OSM maintains the system to provide information to meet the objectives of Title IV specified in Section 403(a).

When a problem area is entered into AMLIS along with the estimated cost of repairing the area, not including design, inspection, and program administration costs, the estimated cost is entered in the unfunded category. When a problem area on the inventory is funded, it is moved to the funded category. Later, when the actual construction is completed, the problem is again moved, this time to the completed category. In this manner, a complete history of the abandoned mine land problems are maintained in AMLIS. The total unfunded costs of all priorities in West Virginia as of August, 2017 are \$1,565,213,613.40.

AML&R Accomplishments

AML&R has completed the problem areas (PA) and the associated problem types from July 1, 2015 through June 30, 2017. The PA and the problem type accomplishments have been entered into AMLIS and moved from the funded to completed category. The Problem Types, Completed Units and Completion Costs are shown below.

Problem Type	Completed Units	Completion Costs
Clogged Streams (Miles)	0.4	\$190,500.00
Dangerous Highwalls (Feet)	21,059	\$5,302,417.20
Dangerous Impoundments (Count)	173	\$3,923,182.18
Dangerous Piles & Embankments (Acres)	39	\$2,854,058.93
Dangerous Slides (Acres)	26.63	\$3,403,280.53
Hazardous Equipment & Facilities (Count)	11	\$26,000.00
Polluted Water: Agricultural & Industrial (Count)	9	\$121,877.00
Polluted Water: Human Consumption (Count)	1,994	\$26,192,079.04
Portals (Count)	162	\$2,255,961.33
Subsidence (Acres)	9.75	\$1,015,894.54
Surface Burning (Acres)	4.75	\$863,018.00
Underground Mine Fires (Acres)	6	\$731,671.66
Vertical Opening (Count)	16	\$209,918.13
Water Problems (Gallons)	309,324.1	\$810,975.30
Total Cost		\$47,900,833.84

The U.S. Office of Surface Mining (OSM) maintains an inventory of abandoned mine problems known as the Abandoned Mine Lands Inventory System (AMLIS). OSM maintains the system to provide information to meet the objectives of Title IV specified in Section 403(a).

When a problem area is entered into AMLIS along with the estimated cost of repairing the area, not including design, inspection, and program administration costs, the estimated cost is entered in the unfunded category. When a problem area on the inventory is funded, it is moved to the funded category. Later, when the actual construction is completed, the problem is again moved, this time to the completed category. In this manner, a complete history of the abandoned mine land problems are maintained in AMLIS. The total unfunded costs of all priorities in West Virginia as of August, 2017 are \$1,565,213,613.40.

AML&R Accomplishments

AML&R has completed the problem areas (PA) and the associated problem types from July 1, 2015 through June 30, 2017. The PA and the problem type accomplishments have been entered into AMLIS and moved from the funded to completed category. The Problem Types, Completed Units and Completion Costs are shown below.

Problem Type	Completed Units	Completion Costs
Clogged Streams (Miles)	0.4	\$190,500.00
Dangerous Highwalls (Feet)	21,059	\$5,302,417.20
Dangerous Impoundments (Count)	173	\$3,923,182.18
Dangerous Piles & Embankments (Acres)	39	\$2,854,058.93
Dangerous Slides (Acres)	26.63	\$3,403,280.53
Hazardous Equipment & Facilities (Count)	11	\$26,000.00
Polluted Water: Agricultural & Industrial (Count)	9	\$121,877.00
Polluted Water: Human Consumption (Count)	1,994	\$26,192,079.04
Portals (Count)	162	\$2,255,961.33
Subsidence (Acres)	9.75	\$1,015,894.54
Surface Burning (Acres)	4.75	\$863,018.00
Underground Mine Fires (Acres)	6	\$731,671.66
Vertical Opening (Count)	16	\$209,918.13
Water Problems (Gallons)	309,324.1	\$810,975.30
Total Cost		\$47,900,833.84

❖ FY 2016

1. OER-LAST provided oversight of the investigation of 11 suspected releases.
2. OER-LAST addressed 7 confirmed releases.
3. OER-LAST provided oversight of the investigation and cleanup completion of 3 leaking aboveground storage tank sites.
4. OER-LAST continues to provide oversight for 4 sites at various stages of the remediation process.

❖ FY 2017 (W. Va. Code § 22-30-3 was amended and became effective June 23, 2017)

1. OER-LAST provided oversight of the investigation of 23 suspected releases.
2. OER-LAST addressed 13 confirmed releases.
3. OER-LAST provided oversight of the investigation and cleanup completion of 5 leaking aboveground storage tank sites.
4. OER-LAST continues to provide oversight for 6 sites at various stages of the remediation process.

Superfund - This section supports the EPA's remedial action for eight National Priority List CERCLA Superfund sites in WV. This Section has one site where EPA has transferred Operation and Maintenance of the selected remedy. This section also supports one Navy Installation Restoration Program Site at Allegheny Ballistics Lab₇ and one Army Corps of Engineers Remedial Action site at WV Ordnance Works. The section also supports five current sites that are assigned to the EPA Office of the On-Scene Coordinator (OSC). The OSCs are generally involved with emergency actions. However, OER supports sites that are legacy issue sites that are not in another remedial action program through the Core Superfund Cooperative Agreement.

Preliminary Assessment Program

This section also takes the lead in site assessments for the EPA CERCLIS Site Preliminary Assessment Program with 8 sites currently in Preliminary Assessments, Site Investigations, or Expanded Site Investigations.

RCRA CA-Resource Conservation and Recovery Act Corrective Action Program (RCRA CA) OER was in a support role for the RCRA CA program, but since 2008, having obtained primacy for the RCRA CA Program, is currently leading remediation at most of the 42 RCRA CA sites in WV.

Department of Defense -This section also provides the lead for remedial activity for DoD sites associated with the Formerly Used Defense Sites (FUDS) and Military Munitions Response Program (MMRP) Programs. OER works with the US Army, Navy, and the US Army Corps of Engineers to remediate MMRP and FUDS sites. OER utilizes the Defense-State Memorandum of Agreement (DSMOA) Program to support the DoD remedial activities.

OER has accomplished the following within the Superfund program in FY 2015 and 2016 (July 1, 2014 June 30, 2016)

- ❖ OER continues to work with EPA Region 3 on the Superfund actions at Morgantown Ordnance Works, the Big John's Salvage site and Sharon Steel/Fairmont Coke site near Fairmont, the Fike-Artel Chemical site in Nitro, the Pantasote site in Point Pleasant, the Allied-Hanlin-Olin Chemical site near New Martinsville, Vienna PCE site in Wood County, the Ravenswood PCE site, and Allegheny Ballistics Laboratory in Mineral County. OER worked collaboratively with EPA Region 3 and the U.S. Army Corps of Engineers at West Virginia Ordnance Works (WVOW) in Point Pleasant.
- ❖ During this time, a West Virginia State Police Barracks has been built on a portion of the Fairmont Coke Site in Marion County. OER played a role in negotiating an agreement with EPA and the Responsible Party, ExxonMobil, to allow an alternative approach to wetlands remediation on the site where the barracks was constructed and obtaining a Letter of Waiver from WVDEP Water Resources so they would not have to obtain a permit, which would have held up a construction start date.
- ❖ OER is working with EPA Region 3 to assess potential Superfund sites via the Pre-Remedial Program. Currently there are 8 active sites and 11 recently completed sites in the preliminary assessment and site investigation program.
- ❖ In addition to WVOW, OER continues to work with the U.S. Army Corps of Engineers on other Formerly Used Defense Sites (FUDS) in the former West Virginia Maneuver Area located in the north-central highlands, which includes Dolly Sods and the surrounding area.
- ❖ OER continues to work collaboratively with EPA Region 3 and has taken the role as the lead regulatory agency on most of the 42 RCRA Corrective Action sites in WV. In August 2014, WV became the first state in the EPA Mid-Atlantic Region 3 to complete all the Human Health Environmental Indicator reports for the Corrective Action

universe. In 2016, an additional Groundwater Environmental Indicator was accomplished, leaving only two to finish, and putting WV at 98% complete. In 2016, two remedies were selected and two Records of Decision were released for public comment.

Rehabilitation Environmental Action Plan (REAP) - This was a strategic initiative signed into law by Governor Joe Manchin in 2005. The governor's bill combined elements of the WVDEP and the Division of Natural Resources into a more effective and streamlined system for the direction of environmental remediation programs. The program provides oversight of litter removal, statewide recycling, and open dump cleanups.

The REAP Program eliminated 2,692 dumps from West Virginia's landscape. This led to the proper disposal of over 9,549 tons of litter/waste. REAP was also responsible for the proper disposal of over 547,553 waste tires. Many of these tires were pulled from the 635 miles of rivers and streams that REAP cleaned during this time.

- ❖ REAP's Pollution Prevention Open Dump Program (PPOD) reclaimed 2,410 acres of land through the eradication of 2,692 dumps. PPOD also removed over 271 appliances from the landscape and recycled more than 62 tons of scrap metal.
- ❖ REAP's Make It Shine Program coordinated the efforts of more than 12,261 volunteers. These volunteers worked to eliminate 42 open dumps and remove 149 tons of litter and debris. The volunteers removed litter from 500 miles of roadways, 461 acres of park, 263 miles of streams, and 100 miles of trails.
- ❖ REAP's Adopt-A- Highway Program had more than 21,495 volunteers in more than 2,091 active groups. They worked to remove more than 500 tons of litter from more than 5,380 miles of roadway.
- ❖ The REAP Litter Control Grant Program, which provides grants to counties and municipalities for litter control and cleanup programs, funded 52 projects totaling \$167,338.
- ❖ The REAP West Virginia Recycling Assistance Grant Program, which provides grants for recycling to public and private entities, awarded 63 grants totaling \$4,056,210.
- ❖ The REAP Covered Electronic Device Grant Program, which offers grants to counties and municipalities wishing to implement electronic device recycling programs or e-cycling events, issued 37 grants totaling \$285,431.69.

Landfill Closure Assistance Program (LCAP) – The LCAP program provides landfill closure assistance to owners/permittees of landfills which were required to cease operations pursuant to Chapter 22 Article 16, which mandated closure deadlines for non-composite lined solid waste facilities. The LCAP program designs and constructs all closure-related activities necessary to provide sufficient leachate management, sediment and erosion control, gas management, groundwater monitoring and a final cover cap on non-composite lined landfills.

- ❖ There are 33 landfills in the Landfill Closure Assistance Program (LCAP); however, only 32 landfills have made application. Synthetic caps have been installed on twenty (20) landfills. Six (6) landfills meet the requirements of a Sub Title D cap (RCRA-earthen cap).
- ❖ Since 2015, closure construction activities have been completed at the Marion County Landfill and the South Charleston Landfill. Closure design work continues for the City of Kingwood Landfill, Elkins- Randolph County Landfill and the City of Wheeling. Closure construction activities are anticipated to begin in fall 2017 or spring 2018.

V. DEPARTMENT of ENVIRONMENTAL PROTECTION

E. Integrated Regulatory Information Support (IRIS)

Technical Applications and Geographical Information Systems (TAGIS) Unit

The TAGIS unit provides central support for all DEP units involved in groundwater activities in the form of geographical database creation and update, analysis, web-based services and applications, and software support.

TAGIS maintains the agency ArcGIS license server that provides access to advanced desktop GIS software. It also has developed automated processes for creating and updating geographical datasets critical for agency programs, including NPDES permits and outlets (which also include underground injection permits), voluntary remediation sites, oil and gas development permits, active mining operations, above ground storage tanks, and others. TAGIS also has developed or obtained a wide range of additional GIS data products related to stream networks, flow estimation, high resolution surface elevation data, soil data used for runoff analysis, public water sources and protection areas, toxics release inventory, and others. Preliminary work has extended the National Hydrology Dataset to allow stream network traversal in karst areas by linking sinking streams and emergent springs based on dye trace data and karst basin maps.

The TAGIS unit continues to expand the agency's web-based mapping capability with both public and internal applications, including a prototype application to interact with the water quality assessment and monitoring data contained in the WABase database maintained by the Watershed Assessment Branch. General purpose web mapping applications, which run in a common web browser, are becoming increasingly flexible and powerful, offering the potential for users to create custom maps to address a wide range of questions related to water quality. These applications leverage the ability to quickly bring together data resources from many organizations at a single place, which then can be shared with anyone via a simple web address. The WVDEP already has access to this capability, which is expected to increase in the near future.

VI. DEPARTMENT OF HEALTH AND HUMAN RESOURCES

Office of Environmental Health Services

A. Well Head Protection Program

Groundwater Protection Goals

As of June 30, 2017, the Wellhead Protection (WHP) program continues to work with the 556-groundwater community, non-community transient and transient public water supply systems on developing WHP programs.

In West Virginia, the Source Water Assessment and Protection (SWAP) Program encompasses both the wellhead “groundwater” protection and surface water protection efforts. Implementation of the wellhead protection program began in the early 1990’s, as part of West Virginia ground water protection strategy. This protection strategy was extended to surface water sources with the 1996 Safe Drinking Water Act Amendments. The Act require states to develop and implement a SWAP program designed to evaluate the vulnerability of public drinking water systems to possible sources of contamination, and encourages states to work with these systems in developing protection and management plans. The Source Water Protection Plan (SWPP) was enacted by WV Senate Bill 373 during the 2014 WV Legislative Session and revision of the 64CSR3, Public Water Supply System regulations to include requirements for utility water systems to update their existing, or file a new comprehensive SWPP for surface water and surface water influenced groundwater (SWIG) systems.

The WHP program targets groundwater water systems for protection on a county or local basis. In many communities, ground water is the only source of drinking water. Once ground water is contaminated it is very expensive to treat or replace.

The WHP program includes public participation, source delineations, the potential contaminant survey, contingency planning and management directives complementing the SWAP program. WHP program is the practice of assessing the quality of our water resources, and implementing programs that reduce pollutants and chemical contaminants which could potentially negatively impact these resources. Protecting water resources from contaminants also can eliminate the need for supplementary treatment procedures, and can delay the cost of new infrastructure and related increases in water rates. It is our hope that this work accomplished in West Virginia and across the United States will be a valuable tool to a public water supply/community and will help in planning and building future capacity for economic growth.

The West Virginia Bureau for Public Health (WVBPH) Office of Environmental Health Services (OEHS) staff continues to complete WHP studies for new public water supply systems and helps revise existing plans within the state by prioritizing efforts, program resources, education and outreach efforts in developing and implementing protection measures. Implementation of the WHP builds on other environmental assessment and protection programs, and requires integrated linkage and cooperation of

the WV Department of Environmental Protection (DEP). Moving to a voluntary protection plan phase will require a multifaceted approach that will require continued financial support within West Virginia. OEHS relies on participation and involvement of federal, state, local agencies, industry, agriculture, environmental groups, public water supplies, and the public at many levels to protect the surface and groundwater of the state and the health of the people of West Virginia. Implementation of the WHP builds on other environmental assessment programs and requires an integrated linkage and cooperation with many associated entities. Follow up assistance and a continuing source of funding for activities will likely be required for sustainability. The WHP program maximizes the use of existing information, requires integration with existing state and federal programs and the use of a Geographic Information System (GIS) to map delineations and assessments.

Program Milestones and Future Priorities

During this reporting cycle, the WHP programs continued to pursue the following:

Building Partnerships-Inter-agency cooperation and other alliances:

- ❖ Continue to participate and build voluntary protection efforts by prioritizing efforts, program resources, education and outreach efforts in developing and implementing voluntary protection measures not only to the local water systems but also to local governments, councils, planners, and other stakeholders.
- ❖ Provide funding for the WVDEP's Underground Injection Control (UIC) Class 5 program to locate UIC Class 5 wells in source water protection and sensitive hydrological areas within West Virginia. This work also includes an inventory of underground and above ground storage tanks in the SWAP/WHP area.
- ❖ Continue participation and provide funding for the Potomac Drinking Water Source Protection Partnership (DWSP). This partnership is composed of water utilities and the various governmental agencies responsible for drinking water protection in the Potomac River Basin.
- ❖ Continue participation with the Ohio River Valley Water Sanitation Commission (ORSANCO) work group on source water protection. This work group is composed of water utilities and the various governmental agencies responsible for drinking water protection in the Ohio River basin.
- ❖ Continue a working relationship between the federal *Safe Drinking Water Act* (SDWA) and the *Clean Water Act* (CWA) programs within the state to provide the most accurate and representative assessment of source waters, based on available data which the state believes best reflects the quality of the resources.
- ❖ Continue to work with the West Virginia Rural Water Association (WVRWA), through a joint project with the U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) is working with the local SWAP and WHP areas within the state.
- ❖ Continue to use hydrogeologic information provided from the United States Geological Survey (USGS) to help define WHP delineation areas.

Public Outreach/Educational Activities:

- ❖ OEHS Staff provides help in developing a protection program, and assessing potential sources of contamination.
- ❖ The WVBPH website (<http://www.wvdhhr.org/oehs/eed/swap/>) continues to provide information on the SWAP/WHP programs (educational materials, posters and brochures) and guide municipalities, water suppliers, or other groups through developing a local SWAP program. In addition, a link is available to a website that provides copies of the initial SWAP/WHP susceptibility assessment reports for the community water systems.
- ❖ WVBPH Source Water Protection GIS website (<https://oehsportal.wvdhhr.org/webportal/>) disseminates relevant source water information to public water supplies, state agencies, federal agencies and local governments to further source water protection.
- ❖ Installation of protection signage along the perimeter of wellhead protection areas. PWSs can use the signs for municipality and non-highway use.

Other Actions for Protection of Sources of Drinking Water

- ❖ Continue to evaluate new public water supply water wells or intakes to assure they are located in areas where contamination threats are minimal. Permits for new public water wells now require an initial survey for potential sources of contamination within 2000 feet of proposed well location with site-specific information used when available.
- ❖ Continue to use the Alternative Monitoring Strategy Program (AMSP), which determines future monitoring frequency reductions, is dependent on having a SWAP/WHP program in place, which requires consistent revisions and updates.
- ❖ Continue to participate in the development of regulations and design standards for water supply wells, private water wells and monitoring wells for the prevention of groundwater contamination.
- ❖ Continue to evaluate public water supply wells to determine whether groundwater sources are under the direct influence of surface water (GWUDI) and/or SWIG.
- ❖ Continue to support the efforts of the WVDEP - Division of Water and Waste Management's (DWWM) and the USGS with its groundwater ambient water quality studies. This program has strived to benchmark raw water quality data for West Virginia aquifers. West Virginia is trying to identify the impacts of various land uses on water quality. This information will help West Virginia avoid future contamination events.
- ❖ Continue to implement the revised regulations and design standards for private water wells, approved April 2, 2008, for the protection of groundwater.

Ground Water Data Collection and Management:

The WHP program acquire a variety of data, including locations and characteristics of public water supply sources, point of entry, potential contaminant sources, and description of watersheds, hydrogeologic settings, and aquifer parameters. This data continues to be collected through field data collection activities, contractor services, as well as programs within federal, state, and local agencies.

OEHS to date has hired additional staff and spent a significant amount of time in developing the WHP programs, creating a GIS program for the storage and display of geologic/hydrologic and regulatory site data, delineations, and existing significant contaminant source inventories. Potential future WHP program needs are as follows:

-
- WV Public Water Systems**
- Public Water Systems Types**
- Community
 - Non Transient
 - Transient
- Sources: Esri, HERE, DeLorme, Intermap, Incent P Corp., GEBCO, USGS, FAO, INRS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
- 08/03/2012

Appendix A

Regulatory Agencies with Groundwater Responsibility and Authority

Department of Agriculture

1900 Kanawha Blvd., E.
Charleston, WV 25305
(304) 558-3708

Department of Environmental Protection

601 57th Street, SE
Charleston, WV 25304

Office of Oil and Gas
(304) 926-0450

Division of Land Restoration
(304) 926-0455

Division of Water and Waste Management
(304) 926-0495

Office of Information Technology
(304) 926- 0499, Ext. 1615

Department of Health and Human Resources

350 Capital Street
Charleston, WV 25301

Office of Environmental Health Services
(304) 558-2981

Environmental Engineering Division
(304) 558-2981

Public Health Sanitation Division
(304) 558-2981